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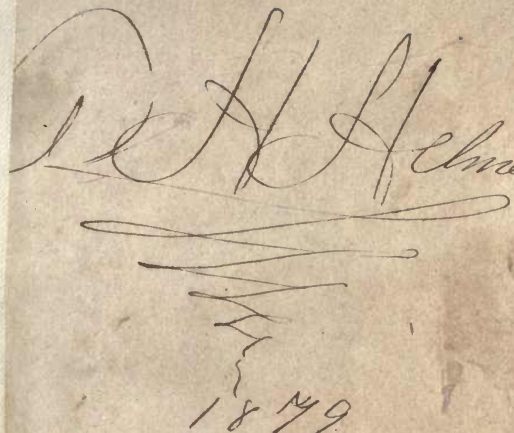

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NATURAL HISTORY

OF

BIRDS.

THEIR ARCHITECTURE, HABITS, AND FACULTIES.

WITH NUMEROUS ENGRAVINGS.

NEW-YORK:
HARPER & BROTHERS, 82 CLIFF-STREET.

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PUBLISHERS' ADVERTISEMENT.

Flowers have been called "the poetry of nature," a compliment which might be applied, with even more justice, to birds; which not only vie with the tulip and the rose in the splendour and beauty of their colours, but in their sprightly and joyous movements, their graceful forms, and, more than all, in the variety and sweetness of their melody, may be said to imbody the very soul of poetry. It must be highly pleasing, therefore, and no less instructive, to study the character and habits of this most interesting portion of "animated nature."

The volume here offered to the public will be found to contain many charming, and scarcely less wonderful things, in relation to the feathered tribes; and the reader will discover that the great Creator has been no less liberal in endowing them with the instincts essential to their individual preservation and happiness, than with the qualities which make them more directly the objects of our admiration and delight.

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H. & B.

New-York, October, 1839.

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INTRODUCTION.

In the "Evenings at Home" of Mrs. Barbauld and Dr. Aikin, one of the few books for children which may be read with profit by persons of all ages, there is an instructive story, entitled "Eyes and No Eyes, or the Art of Seeing." Two schoolboys, at the close of a holyday, set out together to take a summer's walk: one saunters listlessly on, without looking on the right hand or on the left; the other passes nothing without finding some point of interest or amusement. "I have been," says the saunterer, "to Broom Heath, and so round by the windmill upon Camp Mount, and home through the meadows by the river's side; and I thought it very dull, for I scarcely met with a single person; I had rather by half have gone along the turnpike road." "I have had," says the observer, "oh! the pleasantest walk! I went all over Broom Heath, and so up to the mill at the top of the hill, and then down among the green meadows by the side of the river; and I am sure I hardly took a step that did not delight me; I have brought my handkerchief full of curiosities home."

In the account which the observant boy subjoins of his interesting ramble (the other had nothing to tell) over the heath and the meadows, it is remarkable that birds constitute more than two thirds of his story. He saw a wheatear hopping about a pile of stones; a flock of lapwings throwing their fantastic somersets in the air, and one of them tumbling along as if her wing had been broken to lure him from her nest; he saw a kingfisher, with its splendid plumage of green, orange, and blue, darting after

fish in the brook, along the margin of which a family of sandpipers were hunting down aquatic insects, while some swallows which skimmed along on the wing were ready to dart upon the flies which escaped from these swiftfooted pedestrians; he saw bank-swallows burrowing in the bank to shelter their nests from bad weather and worse enemies; he saw a heron take her patient stand at a bend of the river to watch for a passing fish, and, after a successful capture, fly off with her prey to her nest in the woods; and he saw a troop of starlings as numerous as a swarm of bees; the same phenomenon which nearly three thousand years before had afforded Homer a fine poetical simile for a troop of fugitive warriors. "So it is," the narrative concludes; "one man walks through the world with his eyes open, and another with them shut; and upon this difference depends all the superiority of knowledge the one acquires above the other."

There are few persons, even of the well-informed, who, like the schoolboy with "his eyes open," take an interest in such common occurrences as a wheatear hopping over stones, or a swallow hawking for flies over a brook. A taste for natural objects must be awakened and cultivated before enjoyment can be derived from the casual observation (if *study* be a term too strong and repulsive) of the works of creation, either in their picturesque and poetical aspects, or in their beautiful adaptation to their various purposes. But when an interest in natural productions has been once excited, we may confidently promise that the sources of pleasure will become exhaustless, and every walk, however short, will produce, like the ramble of the curious schoolboy, something which has not been observed before.

When Alexander Wilson, the celebrated writer on the Birds of the United States, commenced his arduous task of examining every bird of that country

with his own eyes, he complained that in the works of European naturalists he could only find "a few vague and formal particulars of their size, specific marks, &c., accompanied sometimes with figured representations that would seem rather intended to caricature than to illustrate their originals." With an enthusiasm never excelled, this extraordinary man, who came to the United States a poor and un friended Scotch weaver, first taught himself, at the age of forty years, to draw and colour after nature, then applied himself to the study of various branches of knowledge, and having acquired the power of writing clearly and elegantly, as well as of depicting by his pencil what he saw in his rambles, set out to penetrate through the vast territory of the United States, undeterred by forests and swamps, for the sole purpose of painting and describing the native birds. During seven years in which he prosecuted this undertaking, he travelled more than ten thousand miles, "a solitary, exploring pilgrim," as he describes himself. His labours were rewarded with no worldly riches or honours, for he had the greatest difficulty in procuring subscribers for his splendid work; and when a bookseller at last undertook to print and publish it, the only remuneration which the author received was a payment for the mechanical labour of colouring his own plates. But his soul was set upon the one object of his life; that of giving a complete account of one of the most interesting portions of the works of the Creator, as far as the vast continent of North America afforded him opportunities for diligent examination. He passionately pusued his inquiry into the history of birds. In the preface to the fifth volume of his book, he says, "to me it appears, that of all inferior creatures, Heaven seems to have intended birds as the most cheerful associates of man;" and he declares that he has "a thousand times turned, with a delight bordering on adoration, to the magnificent reposi-

tory of the woods and fields, the grand aviary of nature." Of the difficulties which an accurate student of birds in general has to encounter, and of the particular difficulties which exist in wild and unfrequented districts, Wilson has presented so striking and correct a view, that we cannot deny our readers the pleasure of reading one of the most characteristic passages of this ardent naturalist.

"On many of his subjects it has not been in his power to say much. The recent discovery of some birds, and the solitary and secluded habits of others, have offered great obstacles to his endeavours in this respect. But a time is approaching when these obstacles will no longer exist. When the population of this immense western republic will have diffused itself over every acre of ground fit for the comfortable habitation of man; when farms, villages, towns, and glittering cities, thick as the stars of a winter's evening, overspread the face of our beloved country, and every hill, valley, and stream has its favourite name, its native flocks, and rural inhabitants; then not a warbler shall flit through our thickets but its name, its notes, and habits will be familiar to all, repeated in their sayings, and celebrated in their village songs. At that happy period, should any vestige or memory of the present publication exist, be it known to our more enlightened posterity, as some apology for the deficiencies of its author, that in the period in which he wrote, three fourths of our feathered tribes were altogether unknown even to the proprietors of the woods which they frequented; that, without patron, fortune, or recompense, he brought the greater part of these from the obscurity of ages, gave to each 'a local habitation and a name,' collected from personal observation whatever of their characters and manners seemed deserving of attention; and delineated their forms and features, in their native colours, as faithfully as he could, as records, at least, of their existence."*

* American Ornithology, vol. v., p. 8.

That the present volume may the better fulfil our design of awakening and extending a taste for observing the beauties of nature, we have judged it expedient to leave the beaten path of our predecessors, and to ramble through fields and forests, unfettered by system, but alive to whatever we meet with likely to interest for its curiosity or its novelty.

Before entering upon our immediate subject, we will notice one of the several methods devised by naturalists for arranging birds into various groups according to their prevalent habits, &c. Such arrangements are not only convenient in assisting the memory, but often lead to the discovery of important facts connected with the mutual relations of the several groups.

Quinary System of Classification of Birds.

ORDER I., RAPTORES, Birds of Prey.

1. Family, ———?
2. Family, *Vulturidæ*, Vulture kind.
3. Family, *Falconidæ*, Falcon kind.
4. Family, *Strigidæ*, Owl kind.
5. Family, ———?

ORDER II., INSESSORES, Perchers.

Tribe I., FISSIROSTRES, Cleft Bills.

1. Family, *Meropidæ*, Bee-eater kind.
2. Family, *Hirundinidæ*, Swallow kind.
3. Family, *Caprimulgidæ*, Night-jar kind.
4. Family, *Todidæ*, Tody kind.
5. Family, *Halcyonidæ*, Kingfisher kind.

Tribe II., DENTIROSTRES, Toothed Bills.

1. Family, *Muscicapidæ*, Flycatcher kind.
2. Family, *Laniadæ*, Shrike kind.
3. Family, *Merulidæ*, Thrush kind.
4. Family, *Sylviadæ*, Warbler kind.
5. Family, *Pipridæ*, Chatterer kind.

Tribe III., Conirostres, Conic Bills.

1. Family, *Fringillidæ*, Finch kind.
2. Family, *Sturnidæ*, Starling kind.
3. Family, *Corvidæ*. Crow kind.
4. Family, *Buceridæ*, Hornbill kind.
5. Family, *Loxiadæ*, Grosbeak kind.

Tribe IV., Scansores, Climbers.

1. Family, *Ramphastidæ*, Toucan kind.
2. Family, *Psittacidæ*, Parrot kind.
3. Family, *Picidæ*, Woodpecker kind.
4. Family, *Certhiadæ*, Creeper kind.
5. Family, *Cuculidæ*, Cuckoo kind.

Tribe V., Tenuirostres, Slender Bills.

1. Family, *Nectariniadæ*? Honey-sucker kind.
2. Family, *Cinnyridæ*, Sunbird kind.
3. Family, *Trochilidæ*, Humming-bird kind.
4. Family, *Promeropidæ*, Promerops kind.
5. Family, *Meliphagidæ*, Honey-eater kind.

Order III., RASORES, Scratchers.

1. Family, *Columbidæ*, Dove kind.
2. Family, *Phasianidæ*, Pheasant kind.
3. Family, *Tetraonidæ*, Grous kind.
4. Family, *Struthionidæ*, Ostrich kind.
5. Family, *Cracidæ*, Curassow kind.

Order IV., GRALLATORES, Waders.

1. Family, *Gruidæ*, Crane kind.
2. Family, *Ardeidæ*, Heron kind.
3. Family, *Scolopacidæ*, Snipe kind.
4. Family, *Rallidæ*, Rail kind.
5. Family, *Charadriadæ*, Plover kind.

Order V., NATATORES, Swimmers.

1. Family, *Anatidæ*, Duck kind.
2. Family, *Colymbidæ*, Diver kind.
3. Family, *Alcadæ*, Auk kind.
4. Family, *Pelecanidæ*, Pelican kind.
5. Family, *Laridæ*, Gull kind.

Mr. Vigors farther divides these families into five sub-families, the falcons (*Falconidæ*), for example, thus:

1. *Aquilina*, Eagles.
2. *Asturina*, Hawks.
3. *Falconina*, Falcons.
4. *Buteonina*, Buzzards.
5. *Milvina*, Kites.

NATURAL HISTORY

OF

BIRDS.

THEIR ARCHITECTURE.

CHAPTER I.

MINING BIRDS.

Although the notion that man derived the first hints of mechanical contrivance from the lower animals, may at first view appear plausible, it will be found, when traced circumstantially, no more to accord with the actual origin of inventions than the once popular fancy of tracing the origin of all human knowledge to the Iliad of Homer, or, as the Turks do, to the Koran of Mohammed. Pope, who was essentially the poet of good sense and reason, doubtless believed that some arts were thus acquired, when he said,

> "Learn of the little Nautilus to sail,
> Spread the thin oar and catch the driving gale;"

but the fact itself appears very questionable, inasmuch as the various species of Nautilus (*Nautilidæ*) are not only of rather unfrequent occurrence even where they are indigenous; but, being confined to the locality of warm latitudes, they could not have afforded any hint of boat-building to many tribes, such as the Esquimaux or the New-Zealanders. We

might, apparently with as good reason, attribute the invention of paper-making to wasps: but the recorded history of paper would disprove the theory; for the manner in which wasps make paper was not known previous to 1719, though Réaumur had endeavoured to discover it for twenty years.

We cannot well conceive how it happened that White of Selborne, usually so accurate in his facts, should have committed so many mistakes respecting the bank-swallow. These mistakes are the more unfortunate, as they have been implicitly copied by almost every succeeding writer. "Perseverance," says White, "will accomplish anything; though at first one would be disinclined to believe that this weak bird, with her soft and tender bill and claws, should ever be able to bore the stubborn sandbank without entirely disabling herself; yet with these feeble instruments have I seen a pair of them make great despatch, and could remark how much they had scooped that day by the fresh sand which ran down the bank, and was of a different colour from that which lay loose and bleached in the sun."*

Whoever, on the contrary, looks at the bill and claws of the bird, cannot fail to be convinced, that,

Head of the Bank-Swallow.

so far from being "soft and tender," they are more than commonly hard and sharp, and admirably adapted for digging. The bill, we admit, is small, but its very shortness adds to its strength, as it suddenly ta-

* Nat. Hist. Selborne, vol. i., p. 229, ed. 1825.

pers to a point like a sailor's marlinspike, or, rather, like the points of a pair of fine compasses when shut. If we compare this little sharp borer, as we may well call it, with the caliper-like mandibles of the sand-wasps (*Sphecidæ*, LEACH), and of the burrowing bees, which, like this swallow, excavate galleries proportionable to their size in hard sand,* we are compelled to confess that the bird is furnished with the more efficient instrument. Its operation also is very different. The insects alluded to gnaw into the sand, or, rather, bite off a portion of it, and carry it out of the hole in their mouths; but the bank-swallow, as we have had an opportunity of observing, works with its bill shut. This fact our readers may verify by observing their operations early in the morning, through an opera-glass, when they begin in the spring to form their excavations. In this way we have seen one of these swallows cling with its sharp claws to the face of a sandbank, and peg in its bill as a miner would do his pickaxe, till it had loosened a considerable portion of the hard sand and tumbled it down among the rubbish below. In these preliminary operations it never makes use of its claws for digging; indeed, it is impossible it could, for they are indispensable in maintaining its position, at least when it is beginning its hole.†

We have farther remarked that some of this swallow's holes are nearly as circular as if they had been planned out with a pair of compasses, while others are more irregular in form; but this seems to depend more on the sand crumbling away than upon any deficiency in the original workmanship. The bird, in fact, always uses its own body to determine the proportions of the gallery, the part from the thigh to the head forming the radius of the circle. It does not trace this out as we would do, by fixing a point for the centre around which to draw the circumference. On the contrary, it perches on the

* See Insect Architecture, chap. iii., &c. † J. Rennie.

circumference with its claws, and works with its bill from the centre outwards; and hence it is that in the numerous excavations recently commenced, which we have examined, we have uniformly found the termination funnel-shaped, the centre being always much more scooped out than the circumference. The bird consequently assumes all positions while at work in the interior, hanging from the roof of the gallery with its back downward as often as standing on the floor. We have more than once, indeed, seen a bank-swallow wheeling slowly round in this manner on the face of a sandbank when it was just breaking ground to begin its gallery.*

This manner of working, however, from the circumference to the centre, unavoidably leads to irregularities in the direction, which would not so readily occur by reversing the procedure; for though the radius formed by a part of the bird's body is subject to little variation, yet the little that does occur from the extension or contraction of the neck, must tend to throw it out of the right line. Accordingly, all the galleries are found to be more or less tortuous to their termination, which is at the depth of from two to three feet, where a bed of loose hay and a few of the smaller breast-feathers of geese, ducks, or fowls are spread with little art for the reception of the eggs.†

It may not be unimportant to remark also, that it always scrapes out with its feet the sand detached by the bill; but so carefully is this performed, that it never scratches up the unmined sand or disturbs the plane of the floor, which rather slopes upward, and, of course, the lodgment of rain is thereby prevented. The bank-swallow is eminently a social bird; since it not only always nestles in numerous colonies, but also hunts for insects in troops of from three to fifty, and, as Buffon correctly remarks, associates freely with other swallows.

* J. Rennie. † J. Rennie.

The bird which approaches the nearest to the bank-swallow in its manner of breeding is the stormy petrel (*Thalassidroma pelagica*, Vigors), the storm-swallow of the Dutch, whose great power of wing enables it to sweep over the ocean at every distance from land, and even to weather the most tempestuous winds, while with its webbed feet and light form it can actually walk upon the billows with as much ease as a sparrow can hop along a garden walk. "It is, indeed, an interesting sight," says Wilson, "to observe these little birds, in a gale, coursing over the waves, down the declivities, and up the ascents of the foaming surf that threatens to burst over their heads, sweeping along the hollow troughs of the sea as in a sheltered valley, and again mounting with the rising billow, and just above its surface, occasionally dropping their feet, which, striking the water, throw them up again with additional force, sometimes leaping, with both legs parallel, on the surface of the roughest waves for several yards at a time. Meanwhile they continue coursing from side to side of the ship's wake, making excursions far and wide to the right and to the left, now a great way ahead, and now shooting astern for several hundred yards, returning again to the ship as if she were all the while stationary, though perhaps running at the rate of ten knots an hour. But the most singular peculiarity of this bird is its faculty of standing, and even running on the surface of the water, which it performs with apparent facility. When any greasy matter is thrown overboard, these birds instantly collect around it, facing to windward, with their long wings expanded and their webbed feet patting the water. The lightness of their bodies, and the action of the wind on their wings, enable them with ease to assume this position. In calm weather they perform the same manœuvre by keeping their wings just so much in action as to prevent their feet from sinking below the surface."*

* American Ornithology, vii., 97.

The Stormy Petrel (*Thalassidroma pelagica*, VIGORS). *Length, about six inches.*

"There are," says the same writer in another place, "few persons who have crossed the Atlantic that have not observed these solitary wanderers of the deep skimming along the surface of the wild and wasteful ocean; flitting past the vessel like swallows, or following in her wake, gleaning their scanty pittance of food from the rough and whirling surges. Habited in mourning, and making their appearance generally in greater numbers previous to or during a storm, they have long been fearfully regarded by the ignorant and superstitious, not only as the foreboding messengers of tempests and dangers to the hapless mariner, but as wicked agents, connected some how or other in creating them. 'Nobody,' say they, 'can tell anything of where they come from, or how they breed, though (as sailors sometimes say) it is supposed that they hatch their eggs under their wings as they sit on the water.' This mysterious uncertainty of their origin, and the circumstances above recited, have doubtless given rise to the opinion so prevalent among this class of

men, that they are in some way or other connected with the prince of the power of the air. In every country where they are known, their names have borne some affinity to this belief. They have been called witches,* stormy petrels, the Devil's birds, and Mother Cary's chickens,† probably from some celebrated ideal hag of that name; and their unexpected and numerous appearance has frequently thrown a momentary damp over the mind of the hardiest seaman. It is the business of the naturalist and the glory of philosophy to examine into the reality of these things; to dissipate the clouds of error and superstition, wherever they darken and bewilder the human understanding, and to illustrate nature with the radiance of truth."‡

When we inquire, accordingly, into the unvarnished history of this ominous bird, we find that it is by no means peculiar in presaging storms, for many others of very different families are evidently endowed with an equally nice perception of a change in the atmosphere. Hence it is that, before rain, swallows are seen more eagerly hawking for flies, and ducks carefully trimming their feathers, and tossing up water over their backs, to try whether it will run off again without wetting them. But it would be as absurd to accuse the swallows and ducks on that account of being the cause of rain, as to impute a tempest to the spiteful malice of the poor petrels. Seamen ought rather to be thankful to them for the warning which their delicate feelings of aerial change enable them to give of an approaching hurricane.

"As well," says Wilson, "might they curse the midnight lighthouse that, starlike, guides them on

* Pennant, Arctic Zool., p. 464.

† "This name seems to have been originally given them by Captain Carteret's sailors, who met with these birds on the coast of Chili. See Hawkesworth's Voyages, i., 203."

‡ American Ornithology, vii., 95.

their watery way; or the buoy that warns them of the sunken rocks below, as this harmless wanderer, whose manner informs them of the approach of the storm, and thereby enables them to prepare for it." The petrels are nocturnal birds. When, therefore, they are seen flying about and feeding by day, the fact appears to indicate that they have been driven from their usual quarters by a storm; and hence, perhaps, arose the association of the bird with the tempest. Though the petrels venture to wing their way over the wide ocean as fearlessly as our swallows do over a millpond, they are not, therefore, the less sensible to danger; and, as if feelingly aware of their own weakness, they make all haste to the nearest shelter. When they cannot then find an island or a rock to shield them from the blast, they fly towards the first ship they can descry, crowd into her wake, and even close under the stern, heedless, it would appear, of the rushing surge, so that they can keep the vessel between them and the unbroken sweep of the wind. It is not to be wondered at, in such cases, that their low wailing note of *weet, weet*, should add something supernatural to the roar of the waves and whistling of the wind, and infuse an ominous dread into minds prone to superstition.

The popular opinion among sailors, that the petrels carry their eggs under their wings in order to hatch them, is no less unfounded than the fancy of their causing storms; it is, indeed, physically impossible. On the contrary, the petrels have been ascertained to breed on rocky shores, in numerous communities, like the bank-swallow, making their nests in the holes and cavities of the rocks above the sea, returning to feed their young only during the night, with the superabundant oily food from their stomachs. The quantity of this oily matter is so considerable, that, in the Faro Isles, they use petrels for candles, with no other preparation than drawing a wick through the body of the birds from the mouth

to the rump.* While nestling, they make a clattering or croaking noise, similar to frogs which may be heard during the whole night on the shores of the Bahama and Bermuda Islands, and the coasts of Cuba and Florida, where they abound. Forster says they bury themselves by thousands in holes under ground, where they rear their young and lodge at night; and at New-Zealand, the shores resound with the noise, similar to the clucking of hens or the croaking of frogs, which they send forth from their concealment.

The burrowing owl (*Strix cunicularia*, Molina), found in some of the warmer districts of America, is another mining bird. "In the trans-Mississippian territories of the United States," says Charles Bonaparte, "the burrowing owl resides exclusively in the villages of the marmot or prairie dog, whose excavations are so commodious as to render it unnecessary that our bird should dig for himself, as he is said to do in other parts of the world, where no burrowing animals exist. These villages are very numerous, and variable in their extent, sometimes covering only a few acres, and at others spreading over the surface of the country for miles together. They are composed of slightly-elevated mounds, having the form of a truncated cone, about two feet in width at base, and seldom rising as high as eighteen inches above the surface of the soil. The entrance is placed either at the top or on the side, and the whole mound is beaten down externally, especially at the summit, resembling a much-used footpath."

From the entrance, the passage into the mound descends vertically for one or two feet, and is thence continued obliquely downward until it terminates in an apartment, within which the industrious marmot constructs, on the approach of the cold season, the comfortable cell for his winter's sleep. This cell, which is composed of fine dry grass, is globular

* Pennant, Brit. Zool., ii., 434.

in form, with an opening at top capable of admitting the finger; and the whole is so firmly compacted, that it might, without injury, be rolled over the floor. It is delightful, during the fine weather, to see these lively little creatures sporting about the entrance of their burrows, which are always kept in the neatest repair, and are often inhabited by several individuals. When alarmed, they instantly take refuge in their subterranean chambers; or if the dreaded danger be not immediately impending, they stand near the brink of the entrance, bravely barking and flourishing their tails, or else sit erect to reconnoitre the movements of the enemy. The mounds thrown up by the marmot in the neighbourhood of the Rocky Mountains have an appearance of greater antiquity than those observed on the far-distant plains. They sometimes extend to several yards in diameter, although their elevation is trifling, and, except immediately surrounding the entrance, are clothed with a scanty herbage, which always distinguishes the area of these villages. Sometimes several villages have been observed almost entirely destitute of vegetation; and recollecting that the marmot feeds exclusively on grasses and herbaceous plants, it seems singular that this animal should always choose the most barren spot for the place of his abode. However this may be accounted for, it at least affords an opportunity of beholding the approach of his enemies, and allows him to seek, within the bosom of the earth, that security which he has neither strength nor arms to command.

"In all these prairie-dog villages, the burrowing owl is seen moving briskly about, or else in small flocks scattered among the mounds; and, at a distance, it may be mistaken for the marmot itself when sitting erect. They manifest but little timidity, and allow themselves to be approached sufficiently close for shooting; but if alarmed, some or all of them soar away, and settle down at a short distance. If

farther disturbed, their flight is continued until they are no longer in view, or they descend into their dwellings, whence they are difficult to dislodge. The burrows into which these owls have been seen to descend, on the plains of the river Plorte, where they are most numerous, were evidently excavated by the marmot, whence it has been inferred by Say that they were either common, though unfriendly residents of the same habitation, or that our owl was the sole occupant of a burrow acquired by right of conquest. The evidence of this was clearly presented by the ruinous condition of the burrows tenanted by the owl, which were frequently caved in, and their sides channelled by the rains, while the neat and well-preserved mansion of the marmot showed the active care of a skilful and industrious owner.

"We have no evidence," adds Bonaparte, "that the owl and marmot habitually resort to one burrow; yet we are well assured by Pike and others, that a common danger often drives them into the same excavation where lizards and rattlesnakes also enter for concealment and safety. Throughout the region traversed by the expedition, the marmot was unquestionably the artificer of the burrow inhabited by the owl."*

CHAPTER II.

GROUND BUILDERS.

The essential requisites of a bird's nest are warmth and security, a certain degree of heat being indispensable for hatching the eggs and fostering the

* C. L. Bonaparte, Amer. Ornith. vol i., p. 72.

young, while security from enemies and accidents is no less necessary for successfully rearing the brood. The various means resorted to for fulfilling these conditions afford numerous and interesting illustrations of this delightful part of natural history, and have given rise to much curious discussion among those philosophers who severally ascribe the building operations of birds to foresight and reason; to what is termed instinct, meaning mechanism without intelligence in the agent; or to immediate impulses from the great creative mind of the universe. Without entering into the intricacies of these discussions, we shall enumerate a series of facts from which inferences may be drawn by the advocates of the various systems which attempt to explain the more mysterious operations of the lower animals.

Though the ground is proverbially termed "cold," it requires but slight observation to prove that the popular notion is not strictly correct, and, consequently, that the great number of birds which select it for their nests are not so foolish as might at first view appear. The researches of Saussure, and, more recently, of M. Cordier, prove that at considerable depths the earth does not vary much in temperature; and, without having recourse to the tables drawn up from thermometrical observations, there are two circumstances well known to everybody, which prove that the ground cannot, with strict justice, be termed *cold*. In a morning, when the fields are covered with hoarfrost, it may be observed to be much longer on some places than on others; and if the nature of the substances on which it remains longest be examined, they will uniformly be found to be such as are considered by chymists bad conductors of heat, such as wood, cowdung, and hay; while on the bare ground, particularly in pathways, where it is hard and beaten, and, consequently, better fitted to conduct heat, the hoarfrost is always first

exhaled, because it is sooner reached by the heat emanating from the interior of the earth. The existence of this interior heat is still more obviously proved by the water of springs, which, on its first issuing through the sand, will not freeze, even in severe frost, till it is cooled down by exposure to the cold atmosphere, when it freezes as readily as the water of the next pond.

These facts will be found, as we proceed, to be closely connected with the subject of birds' nests built on the ground; and on that account we may also mention that the interior temperature of the earth is more uniform than the surface, which is exposed to the alternate influence of the sun and the cold air of the night; a circumstance of no little importance in the hatching of eggs. That birds have a very correct notion of the requisite temperature for hatching, is strikingly proved by the ostrich (*Struthio camelus*), and several sea birds, which only sit on their eggs during the night or in moist or gloomy weather, and at other times leave them altogether to the influence of the sunshine.

In by far the greater number of instances, dryness seems to be a no less indispensable condition than warmth. But some birds are known to make use of moist rather than dry materials for their nests. This is well exemplified in a bird peculiar to America, called by Wilson the willet (*Totanus semipalmatus*, Lath.), from its reiterated shrill cry of *Pill-will-willet*, *Pill-will-willet*, which is loud enough to be heard at the distance of half a mile. This bird is very similar to the snipes, but may be readily distinguished from them by short webs at the joinings of the toes. The willets generally begin to lay about the twentieth of May, which is said, from some unknown cause, to be two weeks later than it was twenty years ago. "Their nests," says Wilson, "are built on the ground, among the grass of the salt marshes, pretty well towards the land or

cultivated fields, and are composed of wet rushes and coarse grass, forming a slight hollow or cavity in a tussock. This nest is gradually increased, during the period of laying and sitting, to the height of five or six inches. The eggs are usually four in number, very thick at the great end, and tapering to a narrower point at the other than those of our barn-door fowls. In every instance which has come under my observation, they are placed during incubation in an almost upright position, with the large end uppermost; and this appears to be the common practice of several other species of birds that breed in these marshes."*

The proceedings of the willet, and such birds as thus make choice of moist materials for their nests, among which the song-thrush may be mentioned, are strikingly contrasted with those of several other birds which also build on the ground. We allude here to water-birds, chiefly of the duck family. The long-tailed duck (*Clangula glacialis*, FLEMING), for example, an occasional visitant of England, which breeds in Greenland, Hudson's Bay, and other northern parts, makes her nest among the grass near the sea, lining it with down plucked from her own breast, equally fine and valuable with the well-known eider-down, though it cannot be procured in such quantity.†

It is not generally known, we believe, that any other bird thus robs herself of her own covering, from maternal affection, besides the eider-duck (*Somateria mollissima*, LEACH), whose celebrity requires us to bestow upon it particular attention. For size it approaches nearer to the goose than the duck, being above two feet long, and weighing about seven pounds. Its native country extends from about 45° north to the highest arctic latitudes hitherto explored, both in Europe and America; the Farn Isles, off the coast of Northumberland, and the

* Wilson's Amer. Ornith., vii., 28. † Ibid., 54.

rocky islets beyond Portland, in the state of Maine, being the southern boundary of their breeding places; but they are only very plentiful in Behring's Straits, Labrador, Greenland, Iceland, and other arctic regions.

According to M. T. Brunnich, who wrote an express treatise on the natural history of the eider-duck, their first object, after pairing, is to procure a suitable place for their nest, preferring the shelter of a juniper bush where it can be had, and, where there is no juniper, contenting themselves with tufts of seagrass (*Arundo arenaria*, *Poa maritima*, *Elymus arenarius*, &c.), bundles of seaweed cast up by the tide, the crevices of rocks, or any hollow place which they can find. Some of the Icelandic proprietors of breeding grounds, in order to accommodate them, cut out holes in rows on the smooth sloping banks, where they would not otherwise build, but of which they gladly take possession when thus scooped out.* It is not a little remarkable that, like several other seabirds, they almost always select small islands, their nests being seldom, if ever, found on the shores of the mainland, or even of a large island. The Icelanders are so well aware of this, that they have expended a great deal of labour in actually forming islands, by separating from the main island certain promontories joined to it by narrow isthmuses.

The reason of this preference of islands seems to be security from the intrusion of dogs, cattle, and other land animals, to whose vicinity they have so great an aversion, that the Icelanders are careful to remove these, as well as cats, to a distance from their settlements.

Both the male and the female eider-ducks work in concert in building their nest, laying a rather coarse foundation of drift grass, dry tangle, and seaweed, which is collected in some quantity. Upon this

* Hooker's Tour in Iceland, p. 53.

rough mattress the female eider spreads a bed of the finest down plucked from her own breast, and by no means sparingly, but, as Brunnich informs us, heaping it up, so as to form a thick puffed roll quite round the nest. When she is compelled to go in quest of food after beginning to sit, she carefully turns this marginal roll of down over the eggs to keep them warm till her return. It is worthy of remark, that though the eider-duck lays only five or six eggs, "it is not uncommon to find more than even ten and upward in the same nest occupied by two females which live together in perfect concord;"* a circumstance, however, of which we shall meet with other instances as we proceed.

The quantity of down in each nest is said by Van Troil to be about half a pound, which, by cleaning, is reduced one half. By Pennant, who examined the eiders' nests in the Farn islands, off Northumberland, it is only estimated, when cleaned, at three quarters of an ounce, and this was so elastic as to fill the crown of the largest hat.† The difference of quantity in these two accounts, theoretically ascribed by the translators of Buffon to difference of climate, may have arisen from the one being the first, and the other the second or third nest of the mother duck: for if the first nest be plundered of its down, though she immediately builds a second, she cannot furnish it with the same quantity as before; and, if forced to build a third time, having then stripped her breast of all she could spare, the male is said to furnish what is wanting, which is recognised as being considerably whiter than the female's. When the nest is not robbed, it is said that he furnishes none.

The extraordinary elasticity of the down appears from the fact we have mentioned of three quarters of an ounce filling a large hat. It is worthy of notice, however, that it is only the down taken from

* Van Troil's Letters on Iceland.

† Pennant, Tour in Scotland, 8vo. edit., p. 36.

the nests which has this great elasticity, for what is taken from the dead birds is much inferior, being, as Pontoppidan says, "fat, subject to rot, and far from as light as what the female plucks to form a bed for its young."* The cause of the difference has been attributed either to the down being in great perfection at the breeding season, or to the bird's plucking only her finest and most delicate feathers.

The down taken from the nests becomes a valuable article of commerce, being sold, when cleaned, for three rix dollars (two dollars seventy-five cents) a pound. In 1750, the Icelandic company sold down amounting in value to about $4000, besides what was sent directly to Gluckstadt. Little or none of it is used in the country where it is found. In that rough climate, as Buffon remarks, the hardy hunter, clothed in a bearskin cloak, enjoys in his solitary hut a peaceful, perhaps a profound sleep, while, in polished nations, the man of ambition, stretched upon a bed of eider-down and under a gilded roof, seeks in vain to procure the sweets of repose.

The example of the eider-duck, in plucking the down from her body in order to keep her offspring warm, is not unmatched in the animal world.

The redbreast (*Sylvia rubecula*) is a very early builder, and usually selects for its nest a shallow cavity among grass or moss, in a bank, or at the root of a tree, sometimes in the hole of a tree in a wood or secluded lane, far distant from its winter haunts about the cottage door or the farmyard.

A pair of redbreasts in Kincardineshire, Scotland, from some accidental cause, began to build so early as Christmas; but seeming to be well aware that the woods would not afford them either shelter or subsistence at this inclement season, particularly so far north, they made choice of a greenhouse. Not finding a suitable place in the lower part of the greenhouse, they selected a hole, as a house-sparrow would have done, in the corner of the ceiling;

* Pontoppidan, Nat. Hist. of Norway.

and care being taken to feed them as well as to give them no molestation, they succeeded in rearing a brood of young, to the wonder of all who witnessed the circumstance.

A singularly fanciful account of the redbreast's nest is given by Turner, an English naturalist, who wrote so long ago as the sixteenth century. "The robinet,"* says he, "which hath a red breast both in summer and in winter, nestleth as far as possible from towns and cities, in the thickest copses and orchards, after this manner: when she hath found many oak leaves, she constructeth a nest, and when built, covereth it with arch work, leaving only one way for entrance, for which purpose she builds with leaves a long porch before the doorway, the which when going out to feed, she covereth up with leaves." But as if somewhat skeptical himself respecting his own description, he subjoins, "these things which I now write I observed when a boy, though I do not deny that she may nidificate otherwise; and if any one curious in such matters hath observed her build differently, it will be a gratification to me to learn the same: I have related candidly that which I have seen."

There can be scarcely a doubt, we think, that Turner in this instance was deceived by some dreaming fancy; yet is it afterward copied by almost every ornithologist, from Aldrovand and Willoughby down to Buffon and Bewick. After the nest is built, Willoughby tells us, the bird *often* strews it with leaves, preserving only a narrow winding entrance under the heap, and even shuts the mouth of it with a leaf when she goes abroad. The only circumstance which could have led to such a mistake is, that as the redbreast makes its nest at the root of a tree, a few leaves might have been accidentally drifted over the entrance by the wind; for among some hundreds

* Drayton and other old poets call the redbreast Robinet.

of these nests which we have seen, we never met with one covered in at top with any sort of material piled up for the purpose by the bird, though we have often observed a tuft of grass, a layer of natural grown moss, or part of the root of a tree projecting over it.

Some ground builders, which collect few or no materials, are remarkable for the care they display in selecting a convenient locality. In the nest of a peahen, for example, which we lately examined, we observed that the mother bird had taken care to choose a very sheltered spot, the nest being overhung by a low branch of a spruce fir, which was suspended over it like an umbrella, and completely protected it from rain and dew. Another circumstance was still more remarkable. It is well known that female birds for the most part wear off a considerable portion of the feathers from their breasts by their frequent movements in turning their eggs. Now, as her eggs were placed on the bare earth, no grass growing under the drip of the spruce branch, the breast of our peahen must soon have been rubbed bare of feathers. Foreseeing this event, as it would appear, the careful creature prepared a soft cushion of dry grass, upon which her breast might rest. This cushion was placed on the most exposed side of the nest, but no part of it under the eggs themselves.

CHAPTER III.

MASON BIRDS.

When the least civilized savages take possession of a natural cavern or the hollow of a tree to shel-

ter them from the weather, the indolence of that state in which the ingenuity of man has not been called forth by thought and experience, prevents them from constructing any additional convenience in the form of a door. Even when they take the trouble of making a wigwam of boughs, their substitute for a door consists in narrowing the entrance so that it will only allow of their crawling in on all fours, like their fellow foresters, the bears and foxes. It is only after the dawn of refinement, when invention has been stimulated by the desire of comfort, that we meet with doors curiously and tastefully constructed, possessing certain architectural proportions, as well as adapted to the character of the climate. Among the lower animals, the contrivance of a door of any description is of rare occurrence, and is, we believe, only to be found among a peculiar family of spiders (*Mygalidæ*). But all animals, man included, are soon taught by experience, that protection from enemies is no less necessary than shelter from the inclemencies of weather. The Gothic castle and the walled city have low and narrow portals, opposed to the entrance of a hostile army; and the Indian contracts or barricades his hut to prevent his being devoured by nocturnal beasts of prey.

It is probably both for protection from enemies and for shelter from the weather, that the nut-hatch (*Sitta Europæa*) forms the barricade to her nest, which has suggested the preceding observations. In France, the bird is termed the mason woodpecker. The older naturalists tell us that this little mason selects for breeding the hole of a tree, and if this be larger than she requires, she narrows the entrance with earth and mud so neatly kneaded that a potter could not do it more dexterously. Buffon adds, that she strengthens the fabric of soft earth with small stones, a device which we have observed

practised by a species of the mason bee (*Anthophora retusa*, LEACH).

As there is no masonry nor plastering made use of in the interior of the nut-hatch's nest, we might have been inclined to consider the preceding account as purely fanciful. But we have the testimony of a recent observer, not only to the fact of the clay barricade, but a confirmatory circumstance not a little interesting and curious. Colonel Montagu discovered that if the clay barrier at the entrance of the hole be destroyed while there are eggs in the nest, it is speedily rebuilt to prevent, possibly, the unwelcome intrusion of the woodpecker, and other birds of superior size and strength, which build in similar situations. It appears to us no less probable, that the wall may be constructed to prevent the unfledged young from tumbling out of the nest when they begin to stir about; for all young birds become very restless as they approach the period when they acquire the power, as well as the desire, for rapid movement. The callow brood of most nests have the same impatience that distinguishes children who are about to use their legs: they pant to "imp their young wings."

The cliff-swallow (*Hirundo fulva*, VIEILLOT) is strikingly characterized by having an even and not a forked tail, like its congeners. Instead of a white rump, also, like our window-swallow, it has an iron-brown one, and the same colour, but of a darker shade, under the chin, where our chimney-swallow is red. The upper part of the body, however, has the same glossy violet black, and the wings the same deep brown as the former. "This active little bird," says Bonaparte,* "is, like its congeners, almost continually on the wing, and feeds on flies and other insects while performing its ærial evolutions. Its note is different from that of other swallows, and may be well imitated by rubbing a moistened cork

* See Bonaparte's Birds.

around the neck of a bottle. The species arrive in the west, from the south, early in April, and immediately begin to construct their symmetrical nests, which are perfected by their united and industrious efforts. At the dawn of day they commence their labours by collecting the necessary mud from the borders of the rivers and ponds adjacent, and they persevere in their work until near midday, when they relinquish it for some hours, and amuse themselves by sporting in the air, pursuing insects, &c. As soon as the nest acquires the requisite firmness, it is completed, and the female begins to deposite her eggs, four in number, which are white spotted with dusky brown. The nests are extremely friable, and will readily crumble to pieces; they are assembled in communities, as represented in the engraving.

Nest of the Cliff Swallow (*Hirundo fulva*, VIEILLOT).

In unsettled countries, these birds select a sheltered situation, under a projecting ledge of rock; but in civilized districts, they have already evinced a pre-

dilection for the abodes of man, by building against the walls of houses, immediately under the eaves of the roof, though they have not in the least changed their style of architecture. A nest from the latter situation is now before me: it is hemispherical, five inches wide at its truncated place of attachment to the wall, from which it projects six inches, and consists exclusively of a mixture of sand and clay, lined on the inside with straw and dried grass, negligently disposed for the reception of the eggs. The whole external surface is roughened by the projection of the various little pellets of earth which compose the substance. The entrance is near the top, rounded, projecting, and turning downward, so that the nest may be compared to a chymist's retort, flattened on the side applied to the wall, and with the principal part of the neck broken off. So great is the industry of these interesting little architects, that this massive and commodious structure is sometimes completed in the course of three days."*

White of Selborne thus describes the building process of the window-swallow, or martin (*Hirundo urbica*). "About the middle of May," he says, "if the weather be fine, the martin begins to think in earnest of providing a mansion for its family. The crust or shell of this nest seems to be formed of such dirt or loam as comes most readily to hand, and is tempered and wrought together with little bits of broken straws to render it tough and tenacious. As this bird often builds against a perpendicular wall without any projecting ledge under, it requires its utmost efforts to get the first foundation firmly fixed, so that it may safely carry the superstructure. On this occasion, the bird not only clings with its claws, but partly supports itself by strongly inclining its tail against the wall, making that a fulcrum; and, thus steadied, it works and plasters the materials into the face of the brick or

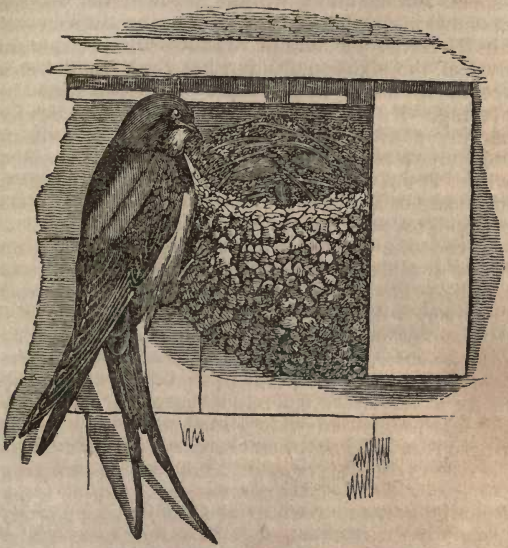
* Bonaparte, Amer. Ornith., i., 67.

stone. But, then, that this work may not, while it is soft and green, pull itself down by its own weight, the provident architect has prudence and forbearance enough not to advance her work too fast; but, by building only in the morning, and by dedicating the rest of the day to food and amusement, gives it sufficient time to dry and harden. About half an inch seems to be a sufficient layer for a day. Thus careful workmen, when they build mud walls (informed at first, perhaps, by this little bird), raise but a moderate layer at a time, and then desist, lest the work should become top-heavy, and so be ruined by its own weight. By this method, in about ten or twelve days, is formed a hemispheric nest with a small aperture towards the top, strong, compact, and warm, and perfectly fitted for all the purposes for which it was intended.

"The shell or crust of the nest is a sort of rustic-work full of knobs and protuberances on the outside: nor is the inside of those that I have examined smoothed with any exactness at all; but is rendered soft and warm, and fit for incubation, by a lining of small straws, grasses, and feathers; and sometimes by a bedding of moss interwoven with wool. They are often capricious in fixing on a nesting-place, beginning many edifices and leaving them unfinished; but when once a nest is completed in a sheltered place, after so much labour is bestowed in erecting a mansion, as nature seldom works in vain, the same nest serves for several seasons. Those which breed in a ready-finished house, get the start in hatching of those that build new by ten days or a fortnight. These industrious artificers are at their labours in the long days before four in the morning; when they fix their materials, they plaster them on with their chins, moving their heads with a quick vibratory motion.

"It has been observed that martins usually build to a northeast or northwest aspect, that the heat

of the sun may not crack and destroy their nests; but instances are also remembered where they bred for many years in vast numbers in a hot, stifled inn-yard, against a wall facing to the south. Birds in general are wise in their choice of situation; but in this neighbourhood, every summer, is seen a strong



The Window-Swallow (*Hirundo ubica*).

proof to the contrary at a house without eaves in an exposed district, where some martins build year by year in the corners of the windows. But as the corners of these windows (which face to the south-east and southwest) are too shallow, the nests are washed down every hard rain; and yet these birds

drudge on to no purpose from summer to summer, without changing their aspect or house. It is a most piteous sight to see them labouring when half their nest is washed away."*

The swallow is a general favourite. He comes to us when nature is putting on her most smiling aspect, and he stays with us through the months of sunshine and gladness. "The swallow," says Sir H. Davy, "is one of my favourite birds, and a rival of the nightingale; for he glads my sense of seeing as much as the other does my sense of hearing. He is the joyous prophet of the year, the harbinger of the best season; he lives a life of enjoyment among the loveliest forms of nature; winter is unknown to him, and he leaves the green meadows of England in autumn, for the myrtle and orange groves of Italy, and for the palms of Africa."

A remarkable contrast to the snug little clay nest of the swallow is presented by the massive, Egyptian-like edifice of a very singular bird, who builds, however, with somewhat similar materials—the flamingo or crimson-wing of the ancients (*Phœnicopterus ruber*, LINN.). The increase of population seems to have partly banished this species, with many other birds, from the shores of Europe to the less frequented waters of America and Africa, where it may be seen, as Campbell describes it,

"Disporting like a meteor on the lakes."

Roberts, a traveller who viewed the bird through a plain prosaic medium, compares a line of them to a brick wall, for which, he says, their colour and attitude may cause them to be taken. Indeed, the appearance of this bird has led to many misconceptions. During the French revolutionary war, when the English were expected to make a descent upon St. Domingo, a negro, having perceived, at the distance of some miles, in the direction of the sea, a

* White's Selborne, i, 272.

long file of flamingoes, ranked up and preening their wings, forthwith magnified them into an army of English soldiers; their long necks were mistaken for shouldered muskets, and their scarlet plumage had suggested the idea of a military costume. The poor fellow accordingly started off to Gonaïves, running through the streets and vociferating that the English were come. Upon this alarm the commandant of the garrison instantly sounded the tocsin, doubled the guards, and sent out a body of men to reconnoitre the invaders; but he soon found, by means of his glass, that it was only a troop of red flamingoes, and the corps of observation marched back to the garrison, rejoicing at their bloodless expedition.

The great length of the legs of flamingoes obviously unfits them for sitting or squatting upon a flat or low nest, as is the practice of the families allied to them; and hence, according to Linnæus, they select for their nests some projecting shelf of a rock, upon which they can sit astride, like a man on horseback, without bending their legs. Without discrediting this account, we subjoin that which Dampier gives of the flamingoes observed by him at Rio de la Hacha, at an island opposite Curaçoa, and at the Isle of Sal. "They make their nest," he says, "in the marshes, where they find plenty of slime, which they heap with their claws, and form hillocks resembling little islets, and which appear a foot and a half above the water. They make the base broad, and taper the structure gradually to the top, where they leave a small hollow to receive their eggs. When they lay or hatch, they stand erect, not on the top, but very near it, their feet on the ground and in the water, leaning themselves against the hillock, and covering the nest with their tail. Their eggs are very long, and as they make their nest on the ground, they could not, without injuring their eggs or their young,

have their legs in the nest, nor sit, nor support their whole body, but for this wonderful instinct which nature has given them."*

The Flamingo (*Phœnicopterus ruber*, LINN.). *The Female is represented in the background on the nest.*

* Dampier's Voy., i. 70.

A similar account is furnished by Catesby, who compares the flamingo, sitting across its nest, to a man on a desk-stool, with his legs hanging down.* Labat, who found these birds breeding in multitudes on the coasts of Cuba and of the Bahama Islands, on the deluged shores and low islets, says, "I was shown a great number of these nests; they resembled truncated cones, composed of fat earth, about eighteen or twenty inches high, and as much in diameter at the base. They are always in the water; that is, in meres or marshes. Their cones are solid to the height of the water, and then hollow, like a pot, baned at top; in this they lay two eggs, which they hatch by resting on them, and covering the hole with their tail. I broke some, but found neither feathers, nor herbs, nor anything that might receive the eggs; the bottom is somewhat concave, and the sides are very even." M. Descourtilz represents the standing position of the female, while hatching, as so fatiguing, that the male is under the necessity of relieving her, though he does so with great reluctance, and when he has no longer the heart to refuse her importunate cries. This is probably little more than the fancy of the naturalist.

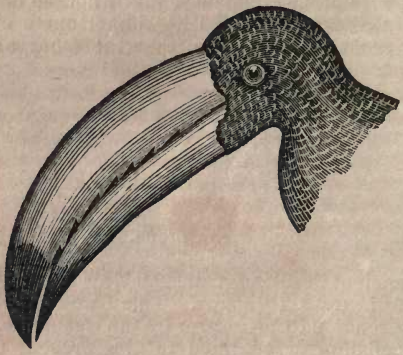
CHAPTER IV.

CARPENTER BIRDS.

The ancient Peruvians called all birds which chisel out holes in trees *Tacatacas*. This name has been literally rendered *Carpenteros* by the Spaniards, and the appellation is contined to the present time.

* Catesby, Carolina, i., 74.

Among these *carpenteros* they rank the toucans (*Ramphastidæ*), but whether they are correct in this it is difficult to decide, in the absence of any very accurate evidence. The bill of the toucan, indeed, seems, upon a slight inspection, to be sufficiently powerful for the task assigned it; but it is found on examination to be much inferior in strength to that appearance of it which is indicated by its size. If it were not, indeed, of light materials, it would be impossible for the bird to carry its head. It is not solid, but full of reticular cells, as thin as paper, over which Dr. Traill, of Liverpool, has shown that the nasal nerves are expanded. Yet the universal opinion of the people where these birds are indigenous is, that it employs its large bill in the formation of a nest in the trunk of a decayed tree. Willughby, speaking of its resemblance to the woodpeckers, says, "it not only hath a like situation of toes, but also in like manner hews holes in trees to build its nest in." "Faber," he adds, "doth not



Head and Bill of a Toucan (Ramphastos Toco).

undeservedly inquire how, seeing the bill so light and thin, the bird can pierce trees with it? Which difficulty he thus satisfies, that though it be thin and light, yet is it of a bony substance, and, therefore, not to be wondered at that, dexterously used by the living animal, it should therewith, by many repeated strokes, pierce a tree, having, perchance, the instinct to choose a rotten one, as we see drops of rain wear holes in flints."*

Woodpeckers of every species (*Picidæ*, Vigors), probably without exception, are carpenters in the sense in which we have used the term, that is, they not only bore into trees in pursuit of insects for food, but chisel out holes for the purpose of nestling. Being endowed by Providence with admirable organs for this purpose, we have a right to infer that they take as much pleasure in the employment of the faculties bestowed upon them as we do in the most agreeable occupations. Buffon, on the other hand, considers such labours a slavish misery to the race of woodpeckers, whom he represents as peculiarly wretched examples of the inequality to be found in the distribution of happiness.

"Animals," says Buffon, "constantly engaged in the pursuit of prey, urged by want and restrained by apprehensions of danger, depend for subsistence on the vigour of their own exertion; and having scarcely time to satisfy their immediate desires, they can have no leisure to cherish the benevolent affections. Such is the solitary condition of all the carnivorous birds, except a few cowardly tribes, which prowl on putrid carrion, and rather combine like robbers than unite as friends.

"But of all the birds which earn their subsistence by spoil, none leads a life so laborious and so painful as the woodpecker. Nature has condemned it to incessant toil and slavery; while others freely

* Ornithology, by Ray, 129.

employ their courage or address, and either shoot on rapid wing, or lurk in close ambush, the woodpecker is constrained to drag out an insipid existence, in boring the bark and hard fibres of trees to extract its humble prey. Necessity never suffers any intermission of its labours, never grants an interval of sound repose: often during the night it sleeps in the same painful posture as in the fatigues of the day. It never shares the cheerful sports of the other inhabitants of the air; it joins not their vocal concerts; and its wild and saddening tones, while they disturb the silence of the forest, express constraint and effort. Its movements are quick; its gestures full of inquietude; its looks coarse and vulgar; it shuns society, even that of its own kind. Such is the narrow and gross instinct suited to a mean and a gloomy life."

It would be difficult to conjecture what train of thinking led the French naturalist to so singular a conclusion. He might, with equal plausibility, have given a similar account of any other animal whose life is spent in active exertion. We turn with pleasure to the enthusiastic defence of the bird, by Wilson, in his account of the gold-winged woodpecker (*Colaptes auratus*, SWAINS.).

"The abject and degraded character," says he, "which the Count de Buffon, with equal eloquence and absurdity, has drawn of the whole tribe of woodpeckers, belongs not to the elegant and sprightly bird now before us. He is not 'constrained to drag out an insipid existence in boring the bark and hard fibres of trees to extrac his prey,' for he frequently finds in the loose, mouldering ruins of an old stump (the capital of a nation of pismires) more than is sufficient for the wants of a whole week. He cannot be said to 'lead a mean and gloomy life, without an intermission of labour,' who usually feasts by the first peep of dawn, and spends the early and sweetest hours of morning on the highest peaks of the tallest trees, calling on his mate or companions, or

pursuing and gambolling with them round the larger limbs and body of the tree for hours together; for such are really his habits. Can it be said that 'necessity never grants an interval of sound repose' to that bird, who, while other tribes are exposed to all the peltings of the midnight storm, lodges dry and secure in a snug chamber of his own constructing; or that 'the narrow circumference of a tree circumscribes his dull round of life,' who, as seasons and inclination inspire, roams from the frigid to the torrid zone, feasting on the abundance of various regions? Or is it a proof that 'his appetite is never softened by delicacy of taste,' because he so often varies his bill of fare, occasionally preferring to animal food the rich milkiness of young Indian corn, and the wholesome and nourishing berries of the wild cherry, sour gum, and red cedar? Let the reader turn to the faithful representation of him given in our figure, and say whether his looks be 'sad and melancholy?' It is truly ridiculous and astonishing that such absurdities should escape the lips or pen of one so able to do justice to the respective merits of every species; but Buffon had too often a favourite theory to prop up, that led him insensibly astray: and so, forsooth, the whole family of woodpeckers must look sad, sour, and be miserable, to satisfy the caprice of a whimsical philosopher, who takes it into his head that they are, and ought to be so."

Not contented with the defence of his gold-winged woodpecker, Wilson returns with renewed spirit to the vindication of the designs of Providence when he comes to the history of a much smaller bird of the same species, the downy woodpecker (*Picus pubescens*). "The principal characteristics," he says, "of this little bird, are diligence, familiarity, perseverance, and a strength and energy in the head and muscles of the neck which are truly astonishing. Mounted on the infected branch of an old apple-tree, where insects have lodged their corroding and de-

structive brood in crevices between the bark and wood, he labours sometimes for half an hour incessantly at the same spot before he has succeeded in dislodging and destroying them. At these times you may walk up pretty close to the tree, and even stand immediately below it, within five or six feet of the bird, without in the least embarrassing him; the strokes of his bill are distinctly heard several hundred yards off; and I have known him to be at work for two hours together on the same tree. Buffon calls this 'incessant toil and slavery;' their attitude 'a painful posture;' and their life 'a dull and insipid existence;' expressions improper because untrue, and absurd because contradictory. The posture is that for which the whole organization of his frame is particularly adapted; and though to a wren or a humming-bird the labour would be both a toil and a slavery, yet to him it is, I am convinced, as pleasant and as amusing as the sports of the chase to the hunter, or the sucking of flowers to the humming-bird. The eagerness with which he traverses the upper and lower sides of the branches; the cheerfulness of his cry; and the liveliness of his motions, while digging into the tree and dislodging the vermin, justify this belief."

Our author's account of the nestling of this active little bird is equally lively. "About the middle of May," says he, "the male and female look out for a suitable place for the reception of their eggs and young. An apple, pear, or cherry tree, often in the near neighbourhood of the farmhouse, is generally pitched upon for this purpose. The tree is minutely reconnoitred for several days previous to the operation, and the work is first begun by the male, who cuts out a hole in the solid wood, as circular as if described with a pair of compasses. He is occasionally relieved by the female, both parties working with the most indefatigable diligence. The direction of the hole, if made in the body of the tree,

is generally downward, by an angle of thirty or forty degrees, for the distance of six or eight inches, and then straight down for ten or twelve more; within roomy, capacious, and as smooth as if polished by the cabinet-maker; but the entrance is judiciously left just so large as to admit the body of the owner. During this labour they regularly carry out the chips, often strewing them at a distance, to prevent suspicion. This operation sometimes occupies the chief part of a week. The female, before she begins to lay, often visits the place, passes out and in, examines every part, both of the exterior and interior, with great attention, as every prudent tenant of a new house ought to do, and at length takes complete possession. The eggs are generally six, pure white, and laid on the smooth bottom of the cavity."*

The red-bellied woodpecker (*Picus Carolinus*) also digs a cavity for its nest, but seems anxious to procure all possible shelter from the weather by selecting the lower side of some lofty branch, that makes a considerable angle with the horizon. It prefers, however, the hollow limb of a tree, making the excavation twelve or fifteen inches above where it becomes solid. The same anxiety for protection leads most of the species to cut out a very narrow opening. That of the yellow-bellied woodpecker (*Picus varius*) Wilson describes as almost exactly circular, and so small, for the size of the bird, that it can creep out and in with difficulty; but within it suddenly widens, descending by a small angle, and then running downward about fifteen inches, the eggs being laid on the smooth solid wood. This plan is also pursued by the red-headed woodpecker (*Picus erythrocephalus*†), which is so little afraid of man that it not unfrequently breeds in the trees growing in the streets of the American cities. Wilson found several of these nests within the bounda-

* Wilson, Amer. Ornith., i., 154.
† Ibid., 145–147.

ries of the city of Philadelphia: two in the button-wood (*Platanus occidentalis*), and one in the decayed limb of an elm. "The old ones," he says, "I observe, make their excursions regularly to the woods beyond the Schuylkill, about a mile distant; preserving great silence and circumspection in visiting their nests; precautions not much attended to by them in the depths of the woods, because there the prying eye of man is less to be dreaded. But notwithstanding the care which this bird, in common with the rest of its genus, takes to place its young beyond the reach of enemies, within the hollows of trees, yet there is one deadly foe, against whose depredations neither the height of the tree nor the depth of the cavity is the least security. This is the black-snake (*Colubor constrictor*), who frequently glides up the trunk of the tree, and, like a skulking savage, enters the woodpecker's peaceful apartment, devours the eggs or helpless young, in spite of the cries and flutterings of the parents; and, if the place be large enough, coils himself up in the spot they occupied, where he will sometimes remain for several days. The eager schoolboy, after hazarding his neck to reach the woodpecker's hole, at the triumphant moment when he thinks the nestlings his own, and strips his arm, launching it down into the cavity, and grasping what he conceives to be the callow young, starts with horror at the sight of a hideous snake, and almost drops from his giddy pinnacle, retreating down the tree with terror and precipitation. Several adventures of this kind have come to my knowledge; and one of them that was attended with serious consequences, where both boy and snake fell to the ground, and a broken thigh and long confinement cured the adventurer completely of his ambition for robbing woodpeckers' nests."*

Were we merely to judge from the bill alone, we should be disposed to consider the ivory-billed wood-

* Wilson's Amer. Ornith., i., 146.

pecker (*Picus principalis*) the prince of the carpenter birds. This powerful instrument is as white, and much tougher, if not harder, than ivory, and elegantly fluted. With this he can dig into the hardest trees, either for food or for nestling. In the low countries of the Carolinas, this bird usually prefers the large timbered cypress swamps for breeding in; and in the trunk of one of these trees, at a considerable height, the male and female alternately, and in conjunction, dig out a large and capacious cavity for their eggs and young. Trees thus dug out have frequently been cut down, with sometimes the eggs and young in them: the hole being said to be generally a little winding, the better to keep out the weather, and from two to five feet deep. The labour of digging out a hole of such dimensions may be considered almost beyond the execution of these birds; but when we read of some of their other feats in carpentry, the fact does not appear in the least surprising. Wilson gives the following interesting history of one which he captured.

"The first place," says he, "I observed this bird at, when on my way to the South, was about twelve miles north of Wilmington, in North Carolina. There I found the bird from which the drawing of the figure was taken. This bird was only wounded slightly in the wing, and, on being caught, uttered a loudly reiterated and most piteous note, exactly resembling the violent crying of a young child, which terrified my horse so as nearly to have cost me my life. It was distressing to hear it. I carried it with me in the chair, under cover, to Wilmington. In passing through the streets, its affecting cries surprised every one within hearing, particularly the females, who hurried to the doors and windows with looks of alarm and anxiety. I drove on, and on arriving at the piazza of the hotel where I intended to put up, the landlord came forward, and a number of other persons who happened to be there, all equally alarmed at what they heard; this was great-

ly increased by my asking whether he could furnish me with accommodations for myself and my baby. The man looked blank and foolish, while the others stared with still greater astonishment. After diverting myself for a minute or two at their expense, I drew my woodpecker from under the cover, and a general laugh took place. I took him up stairs, and locked him up in my room, while I went to see my horse taken care of. In less than an hour I returned, and, on opening the door, he set up the same distressing shout, which now appeared to proceed from grief that he had been discovered in his attempts at escape. He had mounted along the side of the window, nearly as high as the ceiling, a little below which he had begun to break through. The bed was covered with large pieces of plaster, the lath was exposed for at least fifteen inches square, and a hole, large enough to admit the fist, opened to the weather-boards; so that, in less than another hour, he would certainly have succeeded in making his way through. I now tied a string round his leg, and, fastening it to the table, again left him. I wished to preserve his life, and had gone off in search of suitable food for him. As I reascended the stairs I heard him again hard at work, and on entering had the mortification to perceive that he had almost entirely ruined the mahogany table to which he was fastened, and on which he had wreaked his whole vengeance. While engaged in taking the drawing, he cut me severely in several places, and on the whole he displayed such a noble and unconquerable spirit, that I was frequently tempted to restore him to his native woods. He lived with me nearly three days, but refused all sustenance; and I witnessed his death with regret. The head and bill of this bird is in great esteem among the Southern Indians, who wear them by way of amulet or charm, as well as ornament, and, it is said, dispose of them to the Northern tribes at considerable prices. An In-

dian believes that the head, skin, or even feathers of certain birds confer on the wearer all the virtues or excellences of those birds. Thus I have seen a coat made of the skins, heads, and claws of the raven; caps stuck round with heads of butcher-birds, hawks, and eagles; and as the disposition and courage of the ivory-billed woodpecker are well known to the savages, no wonder they should attach great value to it, having both beauty, and, in their estimation, distinguished merit to recommend it."*

CHAPTER V.

PLATFORM BUILDERS.

It seems an essential property of a nest that it should be constructed so as to secure the eggs from rolling out; and the term accordingly always suggests the idea of a cup-shaped cavity, more or less hollow. Many species, however, which nestle on the ground, are neither at the trouble of selecting a hollow place nor of excavating one, but content themselves with a horizontal flat, there being little danger in such positions of the eggs tumbling about. Even should they be moved, the mother bird can easily rearrange them. In cases, also, such as the rotch (*Mergulus melanoleucus*, Ray), which nestles on bare rocks, the mother bird lays only a single egg. We can easily understand why the nests of birds which nestle on the ground are constructed with little art; but what are we to say to the practice of a considerable number of birds which nestle on trees, and other lofty and exposed situations, and form a flat horizontal nest, without the slightest cavity or depression for containing the eggs and young?

* Wilson, Amer. Ornith., iv., p. 24.

The best-known nest of this description is that of the cushat, ring-dove, or wood-pigeon (*Columba Palumbus*, LINN.). The nest of this bird is a very slight structure, and still less calculated for warmth or shelter, the hot nature of the parent birds, according to Albertus Magnus, not requiring this. It may, with the utmost propriety, be called a platform, being composed of a flat pile of twigs, not artfully interwoven, as is stated in some books, but laid crossways upon one another in a rather loose manner, though not without neatness and attention to symmetry; for, when completed, the structure is always very nearly circular. The larger and longest twigs are laid as a foundation, the sizes chosen becoming smaller as the work advances. It is mentioned that in some instances the eggs may be seen through the twigs from below.

The American pigeons are also platform builders; for example, the Carolina pigeon (*Columba Carolinensis*), which, according to Wilson, commences building about the beginning of May, the nest being "very rudely constructed, generally in an evergreen, among the thick foliage of the vine, in an orchard on the horizontal branches of an apple-tree, and in some instances on the ground. It is composed of small twigs, laid with little art, on which are scattered dry fibrous roots of plants, and in this almost flat bed are deposited two eggs of a snowy whiteness."*

A similar mode of building is practised by the American passenger pigeon (*Columba migratoria*), the most prolific of the whole family, and perhaps of all other birds, if the numbers reared be regarded, though it seems to be ascertained that the female only lays a single egg at one hatch. This singular bird inhabits a wide and extensive region of North America, though it does not seem to be known westward of the Great Stony Mountains; but spreads all over Canada, and ranges as far south as the Gulf of Mexico.

* Wilson's Amer. Ornith., v., 93.

The numbers of these birds which associate in their breeding-places almost surpass belief; but the facts are too well authenticated to admit of any doubt. These breeding-places are always in the woods, and sometimes occupy a large extent of forest. "When they have frequented," says Wilson, "one of these places for some time, the appearance it exhibits is surprising. The ground is covered to the depth of several inches with their dung; all the tender grass and underwood destroyed; the surface strewed with large limbs of trees, broken down by the weight of the birds clustering one above another; and the trees themselves, for thousands of acres, killed as completely as if girdled with an axe. The marks of this desolation remain for many years on the spot; and numerous places could be pointed out where for several years after scarce a single vegetable made its appearance. By the Indians, a pigeon-roost or breeding-place is considered an important source of national profit and dependance. The breeding-place differs from the former in its greater extent. In the western countries above mentioned, these are generally in beech woods, and often extend in nearly a straight line across the country for a great way. Not far from Shelbyville, in the State of Kentucky, about five years ago, there was one of these breeding-places, which stretched through the woods nearly in a north and south direction; was several miles in breadth, and was said to be upward of forty miles in extent! In this tract almost every tree was furnished with nests, wherever the branches could accommodate them. The pigeons made their first appearance there about the 10th of April, and left it altogether, with their young, before the 25th of May. As soon as the young were fully grown, and before they left their nests, numerous parties of the inhabitants from all parts of the adjacent country came with wagons, axes, beds, cooking utensils, many of them accompanied by the

greater part of their families, and encamped for several days at this immense nursery. Several of them informed me that the noise in the woods was so great as to terrify their horses, and that, in speaking, it was difficult for one person to make another hear without bawling in his ear. The ground was strewed with broken limbs of trees, eggs, and young pigeons, which had been precipitated from above, and on which herds of hogs were fattening. Hawks, buzzards, and eagles were sailing about in great numbers, and seizing the young from their nest at pleasure; while, from twenty feet upward to the tops of the trees, the view through the woods presented a perpetual tumult of crowding and fluttering multitudes of pigeons, their wings roaring like thunder, mingled with the frequent crash of falling timber; for now the axemen were at work cutting down those trees that seemed to be most crowded with nests, and contrived to fell them in such a manner that in their descent they might bring down several others; by which means the falling of one large tree sometimes produced two hundred young, little inferior in size to the old ones, and almost one mass of fat. On some single tree upward of one hundred nests were found, each containing a single young one only, a circumstance in the history of this bird not generally known to naturalists. It was dangerous to walk under these flying and fluttering millions, from the frequent fall of large branches, broken down by the weight of the multitudes above, and which, in their descent, often destroyed numbers of the birds themselves.

"These circumstances were related to me by many of the most respectable part of the community in that quarter; and were confirmed in part by what I myself witnessed. I passed for several miles through this same breeding-place, where every tree was spotted with nests, the remains of those above described. In many instances I counted upward of

ninety nests on a single tree; but the pigeons had abandoned this place for another, sixty or eighty miles off, towards Green River, where they were said at that time to be equally numerous. From the great numbers that were constantly passing over head to or from that quarter, I had no doubt of the truth of this statement. The beech mast had been chiefly consumed in Kentucky, and the pigeons every morning, a little before sunrise, set out for the Indiana territory, the nearest part of which was about sixty miles distant. Many of these returned before ten o'clock, and the great body generally appeared on their return a little after noon. I had left the public road to visit the remains of the breeding-place near Shelbyville, and was traversing the woods with my gun, on my way to Frankfort, when, about one o'clock, the pigeons, which I had observed flying the greater part of the morning northerly, began the return in such immense numbers as I never before had witnessed. Coming to an opening by the side of a creek called the Benson, where I had a more uninterrupted view, I was astonished at their appearance. They were flying with great steadiness and rapidity, at a height beyond gunshot, in several strata deep, and so close together that, could shot have reached them, one discharge could not have failed of bringing down several individuals. From right to left, as far as the eye could reach, the breadth of this vast procession extended, seeming everywhere equally crowded. Curious to determine how long this appearance would continue, I took out my watch to note the time, and sat down to observe them. It was then half past one. I sat for more than an hour, but, instead of a diminution of this prodigious procession, it seemed rather to increase both in numbers and rapidity; and, anxious to reach Frankfort before night, I rose and went on. About four o'clock in the afternoon I crossed the Kentucky river at the town of Frankfort, at which time the living torrent above my

head seemed as numerous and as extensive as ever. Long after this I observed them in large bodies, that continued to pass for six or eight minutes, and these again were followed by other detached bodies, all moving in the same southeast direction till after six in the evening. The great breadth of front which this mighty multitude preserved would seem to intimate a corresponding breadth of their breeding-place, which, by several gentlemen who had lately passed through part of it, was stated to me at several miles. It was said to be in Green county, and that the young began to fly about the middle of March. On the 17th of April, forty-nine miles beyond Danville, and not far from Green River, I crossed this same breeding-place, where the nests for more than three miles spotted every tree; the leaves not being yet out, I had a fair prospect of them, and was really astonished at their numbers. A few bodies of pigeons lingered yet in different parts of the woods, the roaring of whose wings were heard in various quarters around me. All accounts agree in stating that each nest contains only a single young one. These are so extremely fat, that the Indians and many of the whites are accustomed to melt down the fat for domestic purposes, as a substitute for butter and lard. At the time they leave the nest they are nearly as heavy as the old ones, but become much leaner after they are turned out to shift for themselves."*

The platforms, however, which are thus built by some of the pigeon family, are mere miniatures of the strong, substantial, and extensive structures of the same kind which are formed by a considerable number of birds of prey (*Falconidæ*, Leach). Among these platform-builders on the large scale, we have the griffard, or martial eagle (*Aquila bellicosa*) of Southern Africa, a powerful bird, which preys on antelopes, hares, and similar animals, and is in the habit of soaring so high as to elude the sight. According

* Wilson's Amer. Ornith., v., 207.

to Vaillant, who ranks among the very best observers of the manners of animals, the griffard builds either on the tops of the loftiest trees, or among the most inaccessible and rugged rocks, making its nest quite flat, in the manner of a floor, without any perceptible hollow. It is so firmly constructed that it will bear the weight of a man upon it without giving way, and it will consequently last for a number of years. It is composed at first of several strong rafters of different lengths, according to the distance of the branches or cliffs upon which it is erected. These rafters, again, are interwoven with smaller and more flexible branches, which unite them strongly together, and serve as the foundation of the platform. Over this is piled a considerable quantity of brushwood, moss, dry leaves, heath, and sometimes rushes, if they can be found in the vicinity. The second floor, if we may call it so, is covered with a bed of small pieces of dry wood, upon which, without the addition of any softer materials, the female deposites her eggs. The eyry or nest thus constructed is about four or five feet in diameter, and two feet thick, but it is not very regular in its form. The strong, massive structure of the nest causes it to endure for many years, perhaps during the lives of the couple who build it, if they are not compelled to abandon it on account of danger or alarm. The necessity of building it so very strong will be more obvious when it is considered that the parent birds weigh from twenty-five to thirty pounds, the female being the larger of the two, as is common among birds of prey, exceeding the male in length by about a foot.

The several species of herons may also not improperly be ranked among the platform-builders; for though they construct a shallow depression in the centre of the nest, which is by all the species, if we mistake not, lined with some sort of soft material, such as dry grass, rushes, feathers, or wool, the body of the nest is quite flat, and formed much

in the manner of an eagle's eyry, of sticks crossing one another, and supported upon the branches or between the forks of high trees. All the species also are social, nestling in large communities, after the manner of rooks; though instances are not uncommon of individual pairs breeding solitary.

The plumes of the heron were formerly in high request in Europe, as ornaments for the caps and helmets of the nobility; and they still form a part of the splendid costume of a knight of the garter. In the East they bear a high value. Chardin tells us, that the Persians catch the heron, and, after depriving it of its long feathers, suffer it to depart;* and these plumes even form a part of the royal coronet or crown of Persia. Not only so, but diamonds and other precious stones, set in the shape of heron's feathers, adorn the dhul-bandt of the Persian monarch, some of which are said to be worth more than twenty thousand pounds sterling. In North America also, the Indians, who are very choice in feathers, hold those of the several species of heron in high estimation for ornamenting their hair or topknot, and Wilson tells us they are sometimes seen in the market-place of New-Orleans with bunches of them for sale.

CHAPTER VI.

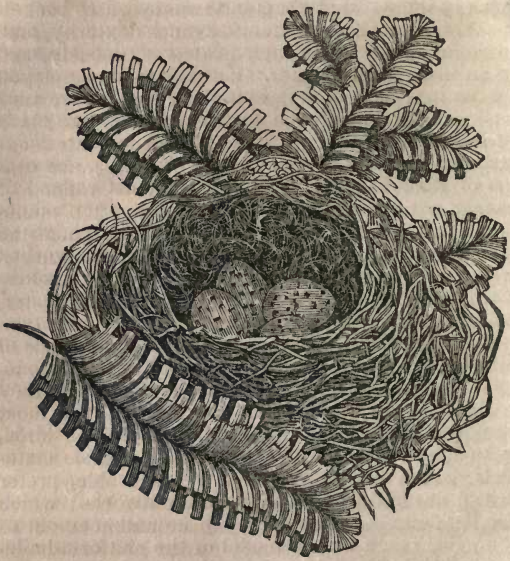
BASKET-MAKING BIRDS.

Although, in many of the instances recorded in this volume, birds far excel us in the neatness and delicacy of their workmanship, yet those which we

* Chardin's Travels, p. 82.

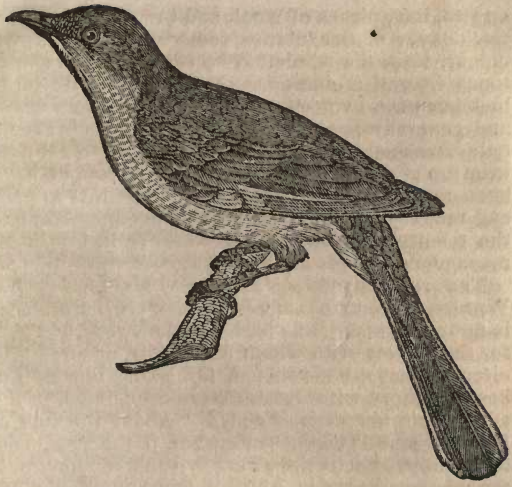
have in the present chapter to compare to basket-makers, do not always manifest much dexterity, and, in some cases, make their nests very loosely, and in an ill-finished manner. The materials employed by the ingenuity of man in making baskets are very various; for though the greater number are made of osiers and other flexible twigs, some are constructed of strips of wood, some of leaves, and others of rushes or reeds. Even the least refined of savage nations are often dexterous in such manufactures. Vaillant saw some baskets among the Gonaqua Hottentots of Southern Africa, worked with reeds in so delicate a manner, and of so close a texture, that they were used for carrying water, milk, and other liquids.

Birds, however, make use of many more kinds of materials in forming their nest-baskets than is done, so far as we know, in our manufactures; while they seldom, if ever, employ osiers as we do. Our most conspicuous and best-known basket-making birds, indeed, so far from always selecting flexible materials, which we should deem indispensable, prefer brittle dead sticks at least for the outworks; which are, in fact, constructed at the commencement of the nest, much on the model of the platform-builders. The bulfinch lays a foundation of birch twigs, placed crosswise in the forks of the branches, paying more attention to the security of the fabric than to its neatness. But when she gets into a spruce pine, finding that the flat branch itself is an excellent foundation, she uses a much smaller number of sticks. When she has reared a groundwork to her mind, she proceeds to collect a quantity of flexible fibrous roots, which she intertwines into a sort of basket-work, rather loose, and only sufficient to hold the eggs and young from rolling down. The inside is wholly lined with fine roots without any hair or feathers.



Nest of the Bulfinch (*Pyrrhula vulgaris*, BRISSON).

The celebrated American mocking-bird (*Orpheus polyglottus*, SWAINS.) makes its nest of similar materials, though it would appear from the description, as well as from Audubon's beautiful figure, to be a more substantial structure. "The precise time," says Wilson, "at which the mocking-bird begins to build his nest, varies according to the latitude in which he resides. In the lower parts of Georgia he commences building early in April; but in Pennsylvania rarely before the 10th of May; and in New-York and the states of New-England still later. There are particular situations to which he gives



The Mocking-bird (*Orpheus Polyglottus*).

the preference. A solitary thornbush; an almost impenetrable thicket; an orange-tree, cedar, or hollybush, are favourite spots and frequently selected. It is no great objection with him that these happen sometimes to be near the farm or mansion house: always ready to defend, but never over-anxious to conceal, his nest, he very often builds within a small distance of the house, and not unfrequently in a pear or apple tree, rarely at a greater height than six or seven feet from the ground. The nest varies a little with different individuals, according to the convenience of collecting suitable materials. A very complete one is now lying before me, and is composed of the following substances. First a quantity of dry twigs and sticks, then withered tops of weeds of the preceding year, intermixed with fine

straws, hay, pieces of wool, and tow; and, lastly, a thick layer of fine fibrous roots, of a light brown colour, lines the whole. The eggs are four, sometimes five, of a cinereous blue, marked with large blotches of brown. The female sits fourteen days; and generally produces two broods in the season, unless robbed of her eggs, in which case she will even build and lay the third time. Attempts have been made to induce these charming birds to pair, and rear their young in a state of confinement, and the result has been such as to prove it, by proper management, perfectly practicable."

The red-winged starling (*Sturnus prædatorius*, Wilson, *Agelaus phœniceus* of modern naturalists) is not only remarkable for his basket-work, but also for the variety with which his nest is, according to circumstances, constructed, furnishing one of the best instances with which we are acquainted, of the adaptation of means to ends. "About the 20th of March," says Wilson, "or earlier, if the season be open, they begin to enter Pennsylvania in numerous, though small parties. These migrating flocks are usually observed from daybreak to eight or nine in the morning, passing to the north, chattering to each other as they fly along; and, in spite of all our antipathy, their well-known notes and appearance, after the long and dreary solitude of winter, inspire cheerful and pleasing ideas of returning spring, warmth, and verdure. Selecting their old haunts, every meadow is soon enlivened by their presence. They continue in small parties to frequent the low borders of creeks, swamps, and ponds, till about the middle of April, when they separate in pairs to breed; and about the last week in April or the first in May, begin to construct their nests. The place chosen for this is generally within the precincts of a marsh or swamp, meadow, or other like watery situation. The spot usually a thicket of alder bushes, at the height of six or seven feet from the ground;

sometimes in a detached bush, in a meadow of high grass; often in a tussock of rushes, or coarse rank grass, and not unfrequently in the ground; in all of which situations I have repeatedly found them. When in a bush, they are generally composed outwardly of wet rushes picked from the swamp, and long tough grass in large quantity, and well lined with very fine bent. The rushes forming the exterior are generally extended to several of the adjoining twigs, round which they are repeatedly and securely twisted; a precaution absolutely necessary for its preservation, on account of the flexible nature of the bushes in which it is placed. The same caution is observed when a tussock is chosen, by fastening the tops together, and intertwining the materials of which the nest is formed with the stalks of rushes around. When placed in the ground, less care and fewer materials being necessary, the nest is much simpler and slighter than before. The female lays five eggs of a very pale light blue, marked with faint tinges of light purple, and long straggling lines and dashes of black. It is not uncommon to find several nests in the same thicket, within a few feet of each other."*

The birds which build in communities in Southern Africa furnish us with exceedingly interesting illustrations upon the subject of this chapter. The locust-eating thrush (*Turdus bicolor*) is one of those species which, according to Barrow, congregate in great numbers. These unite in forming a common fabric for containing individual nests large enough for a vulture. One of these, which he met with on a clump of low bushes at Sneuwberg, consisted of a number of cells, each of which formed a separate nest, with a tubular gallery leading into it through the side. Of such cells each clump contained from six to twenty, one roof of twigs woven into a sort of basket-work covering the whole.

* Wilson, Amer. Ornithol., iv., p. 32.

Another of these gregarious African birds is the pensile grosbeak (*Loxia pensilis*), which is about the size of a house-sparrow, and makes a basket-nest of straw and reeds, interwoven into the shape of a bag, with the entrance below, while it is fastened above to the twig of some tree, chiefly such as grow on the borders of streams. On one side of this, within, is the true nest. The bird does not build a distinct nest every year, but fastens a new one to the lower end of the old, and as many as five may thus be seen, one hanging from another. From five to six hundred such nests have been observed crowded upon one tree.

Nests of the Pensile Grosbeak (Loxia pensilis).

A living author of reputation thus describes these nests; but we must premise that we do not coincide with his opinion of the structure being devised for defence: "Several varieties of the finch tribe, in South Africa, suspend their nests from the branches

of trees, especially where they happen to impend over a river or precipice. The object of this precaution is obviously to secure their offspring from the assaults of their numerous enemies, particularly the serpent race. To increase the difficulty of access to these 'tree-rocked cradles,' the entrance is always from below, and frequently through a cylindrical passage of twelve or fifteen inches in length, projecting from the spherical nest, exactly like the tube of a chymist's retort. The whole fabric is most ingeniously and elegantly woven of a species of very tough grass; and the wonderful instinct of foresight (or whatever else we may choose to call it) displayed by the little architect in its construction, is calculated to excite the highest admiration. I have often seen twenty or more of these beautiful nests hanging from a single tree."*

The following is a more detailed account of either the same or a similar species.

"The baya, or bottle-nested sparrow," says Forbes, "is remarkable for its pendant nest, brilliant plumage, and uncommon sagacity. These birds are found in most parts of Hindostan; in shape they resemble the sparrow, as also in the brown feathers of the back and wings; the head and breast of a bright yellow, and in the rays of a tropical sun have a splendid appearance, when flying by thousands in the same grove; they make a chirping noise, but have no song; they associate in large communities, and cover extensive clumps of palmyras, acacias, and date-trees with their nests. These are formed in a very ingenious manner, by long grass woven together in the shape of a bottle, and suspended by the other end to the extremity of a flexible branch, the more effectually to secure the eggs and young brood from serpents, monkeys, squirrels, and birds of prey. These nests contain several apartments, appropriated to different purposes: in one the hen

* Pringle's Ephemerides, Notes.

performs the office of incubation; another, consisting of a little thatched roof and covering a perch, without a bottom, is occupied by the male, who, with his chirping note, cheers the female during her maternal duties."

Nest of the Baya.

The sociable grosbeak (*Loxia socia*) seems to excel both the preceding species in the extent, if not in the skill, of its workmanship. "I observed," says Vaillant, "on the way a tree with an enormous nest of those birds to which I have given the appellation

Nests of the Sociable Grosbeak (*Loxia socia*).

of republicans; and, as soon as I arrived at my camp, I despatched a few men, with a wagon, to bring it to me, that I might open the hive, and examine its structure in its minutest parts. When it arrived, I cut it to pieces with a hatchet, and saw that the chief portion of the structure consisted of a mass of Boshman's grass, without any mixture, but so compact and firmly basketed together as to be impenetrable to the rain. This is the commencement of the structure; and each bird builds its particular nest under this canopy. But the nests are formed only beneath the eaves of the canopy, the upper surface remaining void, without, however, being useless; as it has a projecting rim and is a little inclined, it serves to let the rain-water run off, and preserves each little dwelling from the rain. Figure to yourself a huge

irregular sloping roof, and all the eaves of which are completely covered with nests, crowded one against another, and you will have a tolerable accurate idea of these singular edifices.

"Each individual nest is three or four inches in diameter, which is sufficient for the bird. But as they are all in contact with one another around the eaves, they appear to the eye to form but one building, and are distinguishable from each other only by a little external aperture, which serves as an entrance to the nest; and even this is sometimes common to three different nests, one of which is situated at the bottom, and the other two at the sides. According to Paterson, the number of cells increasing in proportion to the increase of inhabitants, the old ones become 'streets of communication, formed by line and level.'"*

CHAPTER VII.

WEAVER AND TAILOR BIRDS.

The captain of a ship, who had collected about forty birds from Madagascar, Senegal, and other parts of the African coast, brought to France two of the weaver orioles (*Ploceus textor*, Cuvier), which he called Senegal chaffinches, and which are the only individuals we believe hitherto described by naturalists. They appeared to be of different ages, the elder having a kind of crown, which appeared in sunlight of a glossy golden-brown colour; but at the autumnal moult this disappeared, leaving the head of a yellow colour, though its golden brown was always renewed in the spring of

* Vaillant's Trav., 2d series, vol. iii.

every successive year. The principal colour of the body was yellowish orange, but the wings and tail had a blackish ground. The younger bird had not the golden brown on the head till the end of the second year, which occasioned the excusable mistake of supposing it to be a female, as it is one of the characteristics of female birds to preserve for a long time the marks of youth. The two birds were kept in the same cage, and lived at first upon the best terms with one another, the younger generally sitting on the highest bar, holding its bill close to the other, which it answered by clapping its wings, and with a submissive air.

Having been observed in the spring to interweave chickweed into the wirework of their cage, it was imagined to be an indication of their desire to nestle; and accordingly, upon being supplied with fine rushes, they built a nest so capacious as to conceal one of them entirely. They renewed their labour on the following year; but the younger, which had now acquired its full plumage, was driven off by the other from the nest first begun. Determined, however, not to be idle, it commenced one for itself in the opposite corner of the cage. The elder, however, did not relish this, and, continuing his persecution, they were separated. They went on working at their several buildings; but what was built one day was generally destroyed the next. Latham tell us that one of them, "having by chance got a bit of sewing silk, wove it among the wires, which being observed, more was put into the cage, when the bird interlaced the whole, but very confusedly, so as to hinder the greater part of one side of the cage from being seen through: it was found to prefer green and yellow to any other colour."*

It seems difficult to conceive in what manner a bird could ever be able to interweave materials in

* Gen. Hist. of Birds, iii., p. 117.

the manner just described, with no other instrument than its bill; for it does not appear that the feet are brought into use in the work. In every species of weaving practised by our mechanics, the cross thread or weft is passed between the warp or straight threads by means of a shuttle which goes completely through; but it is very obvious that a bird could not use its bill in this manner, much less its entire body, which, in all known instances of weaver-birds, is much too bulky for this purpose. We need not, however, go to Senegal for specimens of the art of weaving among birds. There are few of those who build their nests with any degree of neatness, that do not, in some part of the structure, exhibit more or less of this peculiar skill. Even those which make very slender nests are sometimes most solicitous to interweave their materials.

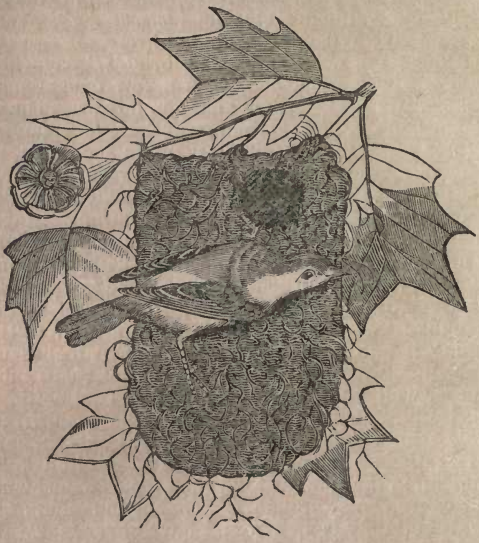
Take any of the nests of the common small birds, which line the interior with hair, and remove the outer basketing of hay or roots, or the feltwork of moss and wool, and there will remain a circular piece of haircloth of various workmanship, according to the ingenuity of the bird and the materials which it has been able to procure. The American kingbird (*Tyrannus intrepidus*, VIEILL.) first forms a sort of basket framework of slender twigs, and the withered flower-tops of the rosy yarrow (*Achillea asplenifolia*, PERS.) and other plants, which are afterward woven together with wool and tow, and lined with interweavings of hair and dry fibrous grass. A bird of the same family, the white-eyed fly-catcher (*M. cantatrix*, BARTRAM), constructs a neat conical hanging nest, "suspended," says Wilson, "by the upper edge of the two sides, on the circular bend of a prickly vine, a species of smilax that generally grows in low thickets. Outwardly it is constructed of various light materials, bits of rotten wood, fibres of dry stalks of weeds, pieces of papers, commonly newspapers, an article almost

always found about its nest, so that some of my friends have given it the name of the politician; all these substances are interwoven with the silk of caterpillars, and the inside is lined with fine dry grass and hair."

But by far the most celebrated nest of this kind is that of the Baltimore starling (*Icterus Baltimore*). We shall give Wilson's account entire.

"Almost the whole genus of orioles," says he, "belong to America, and, with a few exceptions, build pensile nests. Few of them, however, equal the Baltimore in the construction of these receptacles for their young, and in giving them, in such a superior degree, convenience, warmth, and security. For these purposes he generally fixes on the high bending extremities of the branches, fastening strong strings of hemp or flax round two forked twigs corresponding to the intended width of the nest; with the same materials, mixed with quantities of loose tow, he interweaves or fabricates a strong, firm kind of cloth, not unlike the substance of a hat in its raw state, forming it into a pouch of six or seven inches in depth, lining it substantially with various soft substances, well interwoven with the outward netting, and, lastly, finishes with a layer of horsehair, the whole being shaded from the sun and rain by a natural penthouse or canopy of leaves. As to a hole being left in the side for the young to be fed and void their excrements through, as Pennant and others relate, it certainly is an error: I have never met with anything of the kind in the nest of the Baltimore. Though birds of the same species have, generally speaking, a common form of building, yet, contrary to the usually received opinion, they do not build exactly in the same manner. As much difference will be found in the style, neatness, and finishing of the nests of the Baltimores as in their voices. Some appear far superior workmen to others, and probably age may improve them in this as it does

in their colours. I have a number of their nests now before me, all completed and with eggs. One of these, the neatest, is in the form of a cylinder, of five inches diameter, and seven inches in depth, rounded at bottom. The opening at top is narrowed



Baltimore Starling (*Icterus Baltimore*) *and Nest.*

by a horizontal covering to two inches and a half in diameter. The materials are flax, hemp, tow, hair, and wool, woven into a complete cloth, the whole tightly sewed through and through with long horsehairs, several of which measure two feet in length. The bottom is composed of thick tufts of cowhair, sewed also with strong horsehair. This nest was

hung on the extremity of the horizontal branch of an apple-tree, fronting the southeast, was visible one hundred yards off, though shaded by the sun, and was the work of a very beautiful and perfect bird. The eggs are five, white, slightly tinged with flesh-colour, marked on the greater end with purple dots, and on the other parts with long hairlike lines, intersecting each other in a variety of directions. I am thus minute in these particulars from a wish to point out the specific difference between the true and bastard Baltimore, which Dr. Latham and some others suspect to be only the same bird in different stages of colour.

"So solicitous is the Baltimore to procure proper materials for his nest, that, in the season of building, the women in the country are under the necessity of narrowly watching their thread that may chance to be bleaching, and the farmer to secure his young grafts, as the Baltimore, finding the former, and the strings which tie the latter, so well adapted for his purpose, frequently carries off both; or should the one be too heavy and the other too firmly tied, he will tug at them a considerable time before he gives up the attempt. Skeins of silk and hanks of thread have been often found, after the leaves were fallen, hanging round the Baltimore's nest, but so woven up and entangled as to be entirely irreclaimable. Before the introduction of Europeans no such material could have been obtained here; but, with the sagacity of a good architect, he has improved this circumstance to his advantage, and the strongest and best materials are uniformly found in those parts by which the whole is supported."*

One of the prettiest of the woven nests is figured and described by Vaillant in his splendid work on African birds, though he is doubtful what species of bird was the mechanic. The following is his account of this beautiful nest.

* Wilson, Amer. Ornith., i., 26.

"It is, I believe," says he, "the nest of the tchitrec (*Muscicapa cristata*, LATHAM); for though I have never captured the bird of this species on the nest, and am not therefore certain of the fact, my good Klaas, a faithful if not a profound observer, assured me that it was. In one of our journeys through a wood of mimosas, in the country of the Caffres, he discovered and brought me this nest, having seen, he said, and particularly observed, a male and female tchitrec occupied in constructing it. It is remarkable for its peculiar form, bearing a strong resemblance to a small horn, suspended, with the

Nest of the Tchitrec? (*Muscicapa cristata*, LATHAM).

point downward between two branches. Its greatest diameter was two inches and a half, and gradually diminishing towards the base. It would be difficult to explain the principle upon which such a nest had been built, particularly as three fourths of it appeared to be entirely useless and idly made; for the part which was to contain the eggs, and which was alone indispensable, was not more than three inches from the surface. All the rest of this edifice, which was a tissue closely and laboriously woven of slender threads taken from the bark of certain shrubs, seemed to be totally useless. The interior of the nest was not furnished with any sort of soft material, such as down, wool, or hair, but as the female had not laid her eggs when Klaas brought it to me, it is probable that the nest was not quite finished; a fact indeed proved by the birds being still at work at the time."*

Tailor Birds.—It seems no less difficult to conceive in what manner a bird could make its bill perform the office of a needle than that of a weaver's shuttle; yet that this is actually done we have unquestionable evidence, both in the workmanship of the nests of more than one species, and in the ocular testimony of observers who have watched the little mechanics at work. We are, however, more deficient in details upon the process of forming nests by sewing, than in the case of most of the other mechanical operations of birds described in this volume, and therefore our notices must be brief. The most perfect of these descriptions is given by Wilson, respecting the nest of the orchard starling (*Icterus mutatus*), a bird which has created no small confusion among systematic writers, in consequence of the male not arriving at its mature plumage till the third summer, which circumstance has caused it to be mistaken by Buffon and Latham for the female of the Baltimore (*Icterus Baltimore*). Wilson

* Oiseaux d'Afrique, iii., 129.

has cleared up these mistakes in a luminous and satisfactory manner, by coloured figures of the female as well as of the male, in its three different gradations of plumage; while the nest is so very different in structure, that we have deemed it proper to place them in separate chapters.

"These birds" (the orchard starlings), says Wilson, "construct their nests very differently from the Baltimores. They are so particularly fond of frequenting orchards, that scarcely one orchard in summer is without them. They usually suspend their nest from the twigs of the apple-tree, and often from the extremities of the outward branches. It is formed exteriorly of a particular species of long, tough, and flexible grass, knit or sewed through and through in a thousand directions, as if actually done with a needle. An old lady of my acquaintance, to whom I was one day showing this curious fabrication, after admiring its texture for some time, asked me, in a tone between joke and earnest, whether I did not think it possible to learn these birds to darn stockings. This nest is hemispherical, three inches deep by four in breadth; the concavity scarcely two inches deep by two in diameter. I had the curiosity to detach one of the fibres or stalks of dried grass from the nest, and found it to measure thirteen inches in length, and in that distance was thirty-four times hooked through and returned, winding round and round the nest! The inside is usually composed of wool, or the light downy appendages attached to the seeds of the platanus occidentalis or buttonwood, which form a very soft and commodious bed. Here and there the outward work is extended to an adjoining twig, round which it is strongly twisted, to give more stability to the whole, and prevent it from being overset by the wind.

"When they choose the long pending branches of the weeping-willow to build in, as they frequently do, the nest, though formed of the same materi-

als, is made much deeper and of slighter texture. The circumference is marked out by a number of these pensile twigs, that descend on each side like ribs, supporting the whole, their thick foliage at the same time completely concealing the nest from view. The depth in this case is increased to four or five inches, and the whole is made much slighter. These long pendant branches, being sometimes twelve and even fifteen feet in length, have a large sweep in the wind, and render the first of these precautions necessary to prevent the eggs or young from being thrown out; and the close shelter afforded by the remarkable thickness of the foliage is no doubt the cause of the latter. Two of these nests, such as I have here described, are now lying before me, and exhibit not only art in the construction, but judgment in adapting their fabrication so judiciously to their particular situations. If the actions of birds proceeded, as some would have us believe, from the mere impulses of that thing called instinct, individuals of the same species would uniformly build their nest in the same manner, wherever they might happen to fix it; but it is evident from these just mentioned, and a thousand such circumstances, that they reason, *à priori*, from cause to consequences, providently managing with a constant eye to future necessity and convenience."*

According to Buffon and Latham, the bonana starling (*Icterus bonana*) is another of the tailors. It inhabits Martinico, Jamaica, and other West India islands, and builds a nest of a very curious construction, if it can justly be called building. The materials which it uses are fibres and leaves, which it shapes into the fourth part of a globe, and sews the whole with great art to the under part of a bonana leaf, so that the leaf makes one side of the nest.†

But the most celebrated bird of this division is

* Wilson, Amer. Ornith., v., 50.

‡ Latham, General Hist. of Birds, iii., 118.

the one which in the East is, *par excellence*, named the tailor-bird (*Sylvia sutoria*, LATH.), the description of whose performances we would be apt to suspect for an Oriental fiction if we had not a number of the actual specimens to prove their rigid authenticity. We do suspect, however, that these very specimens have misled European naturalists a step beyond the truth in their accounts of its proceedings. "The tailor-bird," says Darwin, "will not trust its

Nest of the Tailor-bird (*Sylvia sutoria*, LATH.), *from Pennants' figure.*

nest to the extremity of a tender twig, but makes one more advance to safety by fixing it to the leaf itself. It *picks up a dead leaf and sews it to the side of a living one*, its slender bill being its needle, and its thread some fine fibres; the lining consists of feathers, gossamer, and down; its eggs are white; the colour of the bird light yellow; its length three inches; its weight three sixteenths of an ounce; so that the materials of the nest and the weight of the bird are not likely to draw down a habitation so slightly suspended."

CHAPTER VIII.

FELT-MAKING BIRDS.

The resemblance of the texture of some of the more elegant nests of small birds to that of a hat or a piece of double-milled woollen cloth, may not have struck many of our readers, because the most compact of the nests alluded to feel loose when compared with a hat or a piece of thick cloth. But, when closely examined, the materials will be found arranged in a very similar manner, being, as it were, carded into one another, and not interwoven thread by thread or hair by hair, as we have described to be the case with the nests of basket-making and weaver birds.

The indispensable substance in all these nests, how different soever they may be in the outward materials, is fine wool, with which the moss, lichen, spiders' nests, tufts of cotton, or bark scales, are carefully and neatly felted into a texture of wonderful uniformity. The wool, of course, is the material by which this is effected, no other substance which the bird could select being capable of matting so

nicely together both its own fibres and the coarser materials which are intermixed with it and stuck over the whole. In many of these nests, though not in all (following the principle of the hatmaker in binding the rim of a hat), greater strength is given to the fabric by binding the whole round with dry grass-stems, or more rarely with slender roots, which are partly covered by the staple feltwork of moss and wool. A circumstance also never neglected, is to bind the nest firmly into the forks of the bush where it is placed, by twining bands of moss, felted with wool, round all the contiguous branches, both below and at the sides.

"On the 10th of May, 1792," says Bolton, "I observed a pair of goldfinches beginning to make their nest in my garden; they had formed the groundwork with moss, grass, &c., as usual, but on my scattering small parcels of wool in different parts of the garden, they in a great measure left off the use of their own stuff and employed the wool. Afterward I gave them cotton, on which they rejected the wool, and proceeded with the cotton; the third day I supplied them with fine down, on which they forsook both the other, and finished their work with this last article. The nest, when completed, was somewhat larger than is usually made by this bird, but retained the pretty roundness of figure and neatness of workmanship which is proper to the goldfinch. The nest was completed in the space of three days, and remained unoccupied for the space of four days, the first egg not being laid till the seventh day from beginning the work."

Vaillant has given more than one narrative of no little interest respecting the proceedings of several species of birds, which construct nests of feltwork in Southern Africa. The pinc-pinc (*Parus* ——), which is one of these, may appear, from a portion of his account, to rank among our weaver-birds. It

may be remarked, however, that the cloth which it fabricates is not woven, but felted.

"The nest of the pinc-pinc," says Vaillant, "is usually placed among prickly shrubs, particularly the mimosas, but sometimes on the extreme branches of trees. It is commonly very large, though some are larger than others; but the difference is only in the external appearance; in the interior they are almost of the same dimensions, namely, from three to four inches in diameter, while the circumference of the exterior is often more than a foot. As the nest is wholly composed of the down of plants, it is either of a snowy whiteness or of a brownish colour, according to the quality of the down which is produced by the neighbouring shrubs. On the outside it appears to be constructed in an irregular and clumsy manner, according to the situation of the branches upon which it is built, and to which it is so firmly attached, part of them passing through its texture, that it is impossible to remove it without leaving one half behind. If, however, the nest have the appearance on the outside of being badly made, we shall be the more surprised, on looking into the interior, that so small a creature, without other instrument than its bill, its wings, and tail, could have wrought vegetable down in such a manner as to render it as united and of as fine a texture as cloth, even of good quality. The nest in question is entirely of a round form, has a narrow neck made in its upper part, by which means the bird glides into the interior. At the base of this corridor there is a niche that has the appearance of a small nest resting against the large one; and at the Cape it is generally supposed that this niche was made expressly for the male to sit upon, in order to keep watch while the female is hatching her eggs, and that he may apprize her of danger when she is at the bottom of the nest and unable to observe an enemy on the outside. This idea, I must confess, is rather ingenious; but I have

ascertained that this sort of niche is not contrived for any such purpose. The male, indeed, sits on the eggs as well as the female, and when either of them is thus occupied, the other never remains as a sentinel at the nest. I am quite confident of this, from having found at least a hundred of these nests, and having watched and observed the birds for whole mornings together. This little recess appears to be nothing more that a perch, by means of which the pinc-pinc may pass more easily into its nest, which, without such a contrivance, it might find some difficulty of accomplishing, as it could not move through so small an opening on the wing; and as the outside of the nest is slightly formed, it would injure it were the bird constantly to rest upon it, while this little space is as strongly built as the interior of the nest. To give it the required solidity, the bird has no other means than beating with its wings, and turning its body in different directions, as I have elsewhere related of the capocier. In consequence of this method of working, the work must necessarily be rounded and have the appearance of a very small nest; a circumstance which has led to the belief that it was made solely for the accommodation of the male. This, however, is so far from being the fact, that when a branch is so situated as to render the entrance into the nest easy, the little cell is not found; and, besides, I found several of these nests with two or three perches, and others in which the perch had little of the form of a small nest.

"In general, these perch-cells are so narrow that the bird, small as it is, could not well rest upon them; and it would be much more difficult for the bird to which Sonnerat attributes this nest. Besides, as I have already stated, I examined the proceedings of these birds whenever an opportunity occurred, and never once observed one placed in th eniche as a watchbird; but I have seen the male and female, on arriving at the nest, perch themselves on the

nearest bough, hop from this upon the edge of the perch-cell, and then, thrusting their heads into the hole, dart into the nest.

"These birds are so tame that there is no need to stand at a distance in order to watch and observe them at leisure, since they will enter in their nest although any one be near them. This is particularly

The Nest of the Pinc-Pinc (*Parus* ———).

the case in the wildest districts, where they are not disturbed by children. Nevertheless, I was never able to surprise them in the nest, not even during the night, because it is invariably placed in the midst of brambles, and cannot be approached without disturbing them; it is never built in an isolated bush, but always in the midst of a clump of bushes difficult of access.

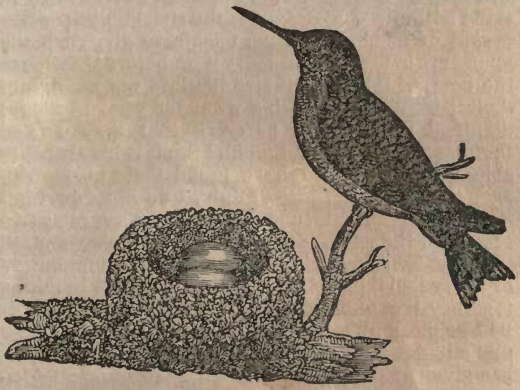
"It is also remarkable, that the first nest of a very young pair is never so large nor so well constructed as those which they afterward make; an observation which, I think, holds very generally in respect of birds.

"A nest so commodious and soft as that of the pinc-pinc is envied by many birds which are unhappily superior to it in strength, and which, after having broken its eggs and compelled it to flight, despoil its habitation. Thus it frequently happens, that when a pair of pinc-pincs have finished the workmanship of their little nest, and even sometimes after having made several of these, they have not had the pleasure of possessing an asylum for their young. A sad example of what is seen in the affairs of men, among whom the most powerful have exercised absolute dominion and obliged the weaker to obey."*

We may with great propriety place here the smallest and prettiest nests with which we are acquainted, those of the humming-birds (*Trochilidæ*, Vigors), with whose appearance many of our readers may be familiar, as they are by no means uncommon in museums, their extreme neatness of execution and their minute size causing them to be highly prized. By far the best description of these which we have met with, is that by Wilson of the red-throated humming-bird (*Trochilus colubris*). "About the 25th of April," he says, "the humming-bird usually arrives in Pennsylvania, and about the 10th

* Oiseaux d'Afrique, vol. iii., p. 91.

of May begins to build its nest. This is generally fixed on the upper side of a horizontal branch, not among the twigs, but on the body of the branch itself. Yet I have known instances where it was attached by the side to an old moss-grown trunk, and others where it was fastened on a strong rank stalk or weed in the garden; but these cases are rare. In the woods it very often chooses a white-oak sapling to build on, and in the orchard or garden selects a pear-tree for that purpose. The branch is seldom more than ten feet from the ground. The nest is about an inch in diameter, and as much in depth. A very complete one is now lying before



Nest of the Humming-Bird.

me, and the materials of which it is composed are as follows: The outward coat is formed of small pieces of a species of bluish-gray lichen that vegetates on old trees and fences, thickly glued on with the saliva of the bird, giving firmness and consistency to the whole, as well as keeping out moisture.

Within this are thick matted layers of the fine wings of certain flying seeds closely laid together: and, lastly, the downy substance from the great mullein and from the stalks of the common fern lines the whole. The base of the nest is continued round the stem of the branch, to which it closely adheres, and, when viewed from below, appears a mere mossy knot or accidental protuberance. The eggs are two, pure white, and of equal thickness at both ends. On a person's approaching their nest the little proprietors dart around with a humming sound, passing frequently within a few inches of his head; and should the young be newly hatched, the female will resume her place upon the nest, even while you stand within a yard or two of the spot. The precise period of incubation I am unable to give; but the young are in the habit, a short time before they leave the nest, of thrusting their bills into the mouths of their parents, and sucking what they have brought them. I never could perceive that they carried them any animal food, though I think it highly probable they do. As I have found their nests with eggs so late as the 12th of July, I do not doubt but that they frequently, and perhaps usually, raise two broods in the same season."*

But as there would be no end to our enumeration of every individual bird which exhibits skill in felting together the materials of their nests, we think it will be more interesting to our readers to conclude this chapter with the lively narrative which Vaillant has given of the proceedings of a pair of small African birds.

This romantic though accurate naturalist had contrived, by tempting titbits, to render the species alluded to, which he calls the Capocier (*Sylvia macroura*, LATHAM), so familiar, that a pair of these birds regularly entered his tent several times a day,

* Wilson, Amer. Orinth., ii., 18.

and even seemed to recognise him in the adjacent thickets as he passed along. "The breeding season," he goes on, "had no sooner arrived, than I perceived the visits of my two little guests to become less frequent, though, whether they sought solitude the better to mature their plans, or whether, as the rains had ceased and insects became so abundant that my titbits were less relished, I cannot tell, but they seldom made their appearance for four or five successive days, after which they unexpectedly returned, and it was not long before I discovered the motives that had brought them back. During their former visits they had not failed to observe the cotton, moss, and flax which I used to stuff my birds with, and which were always lying on my table. Finding it, no doubt, much more convenient to come and furnish themselves with these articles there than to go and pick the down from the branches of plants, I saw them carry away in their beaks parcels of these much larger in bulk than themselves.

"Having followed and watched them, I found the place which they had selected for constructing the cradle which should contain their infant progeny. In a corner of a retired and neglected garden belonging to the good Slaber there grew, by the side of a small spring beneath the shelter of the only tree which ornamented that retreat, a high plant, called by the colonists of the Cape *Capoc-bosche*. In this shrub they had already laid a part of the foundation with moss, the fork of the branches chosen for the reception of the nest being already bedded therewith. The first materials were laid on the 11th of October. The second day's labour presented a rude mass, about four inches in thickness, and from five to six inches in diameter. This was the foundation of the nest, which was composed of moss and flax, interwoven with grass and tufts of cotton.

"I passed the whole of the second day by the side of the nest, which the female never quitted from the

moment my windows were opened in the morning till nearly ten o'clock, and from five o'clock in the evening till seven. On the morning of the 12th, the male made twenty-nine journeys to my room, and in the evening only seventeen. He gave great assistance to the female in trampling down and pressing the cotton with his body, in order to make it into a sort of feltwork.

"When the male arrived with parcels of moss and cotton, he deposited his load either on the edge of the nest or upon branches within the reach of the female. He made four or five trips of this kind without interruption, and then set about helping his mate in the execution of her work.

"This agreeable occupation was often interrupted by innocent and playful gambols, though the female appeared to be so actively and anxiously employed about her building as to have less relish for trifling than the male; and she even punished him for his frolics by pecking him well with her beak. He, on the other hand, fought in his turn, pecked, pulled down the work which they had done, prevented the female from continuing her labours, and, in a word, seemed to tell her, 'You refuse to be my playmate on account of this work, therefore you shall not do it!' It will scarcely be credited, that, entirely from what I saw and knew respecting these little altercations, I was both surprised and angry at the female. In order, however, to save the fabric from spoliation, she left off working, and fled from bush to bush for the express purpose of teasing him. Soon afterward, having made matters up again, the female returned to her labour, and the male sung during several minutes in the most animated strains. After his song was concluded he began again to occupy himself with the work, and with fresh ardour carried such materials as his companion required, till the spirit of frolic again became buoyant, and a scene similar to that which I have just de-

scribed recurred. I have witnessed eight interruptions of this kind in one morning. How happy birds are! They are certainly the privileged creatures of nature, thus to work and sport alternately as fancy prompts them.

"On the third day the birds began to rear the side walls of the nest, after having rendered the bottom compact by repeatedly pressing the materials with their breasts, and turning themselves round upon them in all directions. They first formed a plain border, which they afterward trimmed, and upon this they piled up tufts of cotton, which was felted into the structure by beating and pressing with their breasts and the shoulders of their wings, taking care to arrange any projecting corner with their beaks so as to interlace it into the tissue and render it more firm. The contiguous branches of the bush were enveloped, as the work proceeded, in the side walls, but without deranging the circular cavity of the interior. This part of the nest required many materials, so that I was quite astonished at the quantity which they used.

"On the seventh day their task was finished; and, anxious to examine the interior, I determined to introduce my finger, when I felt an egg that had probably been laid that morning, for on the previous evening I could see there was no egg in it, as it was not quite covered in. This beautiful edifice, which was as white as snow, was nine inches in height on the outside, while in the inside it was not more than five. Its external form was very irregular on account of the branches which it had been found necessary to enclose; but the inside exactly resembled a pullet's egg placed with the small end upward. Its greatest diameter was five inches, and the smallest four. The entrance was two thirds of the whole height, as seen on the outside; but within it almost reached the arch of the ceiling above.

"The interior of this nest was so neatly worked

and felted together, that it might have been taken for a piece of fine cloth a little worn, the tissue being so compact and close that it would have been impossible to detach a particle of the materials without tearing the texture to pieces; yet was this only effected by the process which I have already de-

Nest of the Capocier (*Sylvia macroura*, LATHAM), *from Vaillant's figure.*

scribed; and it must be confessed that it was a work truly admirable, considering the instruments of the little mechanics."*

CHAPTER IX.

CEMENTERS.

One of the old classifications of birds ranged them in three divisions, the first comprehending those which muddled in the dust; the second, those which washed in the water; and the third, those which did both. A division, something upon the same principle, with regard to the building of nests, would comprehend, in the first class, birds which used no salivary cement; in the second, those which did; and in the third, those which used it only in a portion, not the whole of their structures. In no circumstance of nest-building has there been more error promulgated in books of natural history than with respect to this cement, few naturalists seeming to be aware of its existence; but finding nests so neatly compacted, and their parts adhering firmly to one another as well as to walls and boughs of trees, authors think it requisite to name some adhesive material by which this is accomplished; and, when there is no clay in the edifice, spiders' web is the substance generally fixed upon. We do not indeed deny that both the webs of spiders and of the social caterpillars are partly employed by some birds; but this is by no means an occurrence common to all the small, neatly-built nests of our song-birds and some others, as we are taught in books to believe. As this very point involves one of the most curious discussions connected with the subject of nests, we

* Oiseaux d'Afrique, iii., 77, &c.

shall begin with one about which there can be the least dispute. We are furnished with an instance well adapted for this purpose in the American chimney-swallow (*Cypselus pelasgius*, LATHAM).

Wilson has given the following very interesting history of their mode of nestling. "They arrive," he says, "in Pennsylvania late in April or early in May, dispersing themselves over the whole country, wherever there are vacant chimneys in summer sufficiently high and convenient for their accommodation. In no other situation with us are they observed at present to build. This circumstance naturally suggests the query, Where did these birds construct their nests before the arrival of Europeans in this country, when there were no such places for their accommodation? I would answer, probably in the same situations in which they still continue to build in the remote regions of our western forests, where European improvements of this kind are scarcely to be found; namely, in the hollow of a tree, which in some cases has the nearest resemblance to their present choice of any other. One of the first settlers in the State of Kentucky informed me that he cut down a large hollow beech-tree which contained forty or fifty nests of the chimney-swallow, most of which, by the fall of the tree or by the weather, were lying at the bottom of the hollow, but sufficient fragments remained adhering to the sides of the tree to enable him to number them. They appeared, he said, of some years' standing. The present site which they have chosen must, however, hold out many more advantages than the former, since we see that in the whole thickly-settled parts of the United States these birds have uniformly adopted this new convenience, not a single pair being observed to prefer the woods.

"Security from birds of prey and other animals, from storms that frequently overthrow the timber, and the numerous ready conveniences which these new situations afford, are doubtless some of the ad-

vantages. The choice they have made certainly bespeaks something more than mere unreasoning instinct, and does honour to their discernment."

To the following passage we request particular attention.

"The nest of this bird is of singular construction, being formed of very small twigs fastened together with a strong adhesive glue or gum, which is secreted by two glands, one on each side of the hind head, and mixes with the saliva. With this glue, which becomes hard as the twigs themselves, the whole nest is thickly besmeared. The nest itself is small and shallow, and attached by one side or edge to the wall, and is totally destitute of the soft lining with which the others are so plentifully supplied. The eggs are generally four, and white. They generally have two birds in the season. The young are fed at intervals during the greater part of the night, a fact which I have had frequent opportunities of remarking, both here and in the Mississippi territory. The noise which the old ones make in passing up and down the funnel has some resemblance to distant thunder. When heavy and long-continued rains occur, the nest, losing its hold, is precipitated to the bottom. This disaster frequently happens. The eggs are destroyed; but the young, though blind (which they are for a considerable time), sometimes scramble up along the vent, to which they cling like squirrels, the muscularity of their feet and the sharpness of their claws at this tender age being remarkable. In this situation they continue to be fed for perhaps a week or more. Nay, it is not uncommon for them voluntarily to leave the nest long before they are able to fly, and to fix themselves on the wall, where they are fed until able to hunt for themselves."*

Since Wilson seems to be certain that the glutinous substance employed by the American chimney-

* Wilson, Amer. Ornith., v., 50.

swallow to cement the materials of its nest, is derived from glands distinguished both in function and situation from the common salivary glands, we may perhaps be authorized to infer that similar glands exist in the head of the swallow called salangane, and by naturalists the esculent swallow (*Hirundo esculenta?* Lath.)* As this singular nest has for many centuries been an object of curiosity among naturalists, it is scarcely credible that it should still, up to the present time, remain involved in mystery; and, to use the words of Dr. Fleming, "it is much to be regretted that the recent historians of those regions have added so little to its history."

The earliest modern account of these edible nests which we have met, is given by Bontius, a Dutch physician, who resided in Java, and published some excellent works on the natural history and diseases of the East. "On the seacoast," says he, "of the kingdom of China, a sort of small particoloured birds, of the shape of swallows, at a certain season of the year, namely, their breeding time, come out of the midland country to the rocks, and from the foam or froth of the seawater dashing and breaking against the bottom of the rocks, gather a certain clammy, glutinous matter, perchance the sperm of whales or other fishes, of which they build their nests, wherein they lay their eggs and hatch their young. These nests the Chinese pluck from the rocks and bring them in great numbers into the East Indies to sell; which are esteemed by gluttons great delicacies, who, dissolving them in chicken or mutton broth, are very fond of them, preferring them far before oysters, mushrooms, or other dainty and liquorish morsels."

Kircher, Du Halde, and others, candidly confess that the substance composing these nests is unknown; while others deal in theoretical conjectures.

† This epithet is not very appropriate, as it is not the bird which is eaten, but its nest.

Some seem to suppose they are made of shells, describing them as marked like these with ridges and rugosities, and consisting of numerous cells as if a number of shells had been conglutinated together. Others say they are composed of seafoam, or of the juice of a tree called *calambouc*. Kæmpfer again tells us he was assured by the Chinese fishers that the nests are an artificial production, at least those usually sold being nothing but a preparation of marine polypi, as isinglass is the dried swim-bladder of the sturgeon (*Accipenser Huso*, and *A. Ruthenus*).

It seems impossible to come to any satisfactory decision upon statements varying in so many important circumstances. Were we to determine the substance employed from the concurring testimony of numbers, we should certainly fix upon what is indefinitely called seafoam. Marsden, indeed, expressly affirms, that "the birds, during their building-time, are seen in large flocks on the beach, collecting in their bills the foam which is thrown up by the surf. Of this there is little doubt, but they constructs their nest, after it has undergone, perhaps, a preparation from a commixture with the saliva or other secretion with which nature may have provided them for that purpose."*

But in opposition to this it is urged that the caves where the nests are found are not always by the seaside. Mr. Crawford, the late British resident at the court of the Sultan of Java, who superintended for several years the collecting of these nests at Karang-Bolang, tells us that "very productive caves are found in the interior of the country, and at least fifty miles from the sea. It appears probable that they are most abundant on the seaside, only because caverns are there most frequent and least liable to disturbance. This seems to prove that seafoam, or other marine production, has no share in the formation of the nest; and the most probable hypothesis is,

* Marsden's Sumatra, i., 260.

that the nest is a material elaborated from the food of the bird, a conjecture which would be proved, if, on a skilful dissection, it were discovered that the bird has any peculiar organs destined to perform such a process."*

"In the Java swallow," says Sir Everard Home, "we have a structure of a particular nature; there is a membranous tube surrounding the duct of each of the gastric glands, which, after projecting into the gullet a little way, splits into separate portions like the petals of a flower. That the mucus of which the nest is composed is secreted from the surface of these membranous tubes, there is no more doubt than that the gastric juice is secreted from the glands whose ducts these tubes surround. For what purpose so extraordinary an apparatus could be provided would probably have puzzled the weak intellects of human beings, and given rise to many wild theories, had not the animal matter of which the bird's nest is composed, and the accurate observation of Sir Stamford Raffles, led to the discovery of its use."

Notwithstanding this apparently conclusive investigation, however, we cannot avoid giving the opinion of Dr. Fleming, who says that, "though the use of these lobes may puzzle, we cannot admit that there is a shadow of proof, even from analogy, to conclude that these secrete the materials of the nest.*†"

It may give some solution to this discrepance to mention that M. Lamouroux says positively there are three species, of which the smallest makes the most valuable nest. He is farther decidedly of opinion, that the white nests of the smallest species are chiefly composed of seaplants belonging to his *Gelidia*, the second division of his *Thalassiophytes*, which, by boiling or maceration, can be almost wholly reduced to a gelatinous substance. The larger

* History of the Indian Archipelago, vol. iii., p. 432.
† Philosophy of Zoology, vol. ii., p. 238, note.

inland species, on the other hand, make use of opaque materials, and never of marine plants.

It would be presumptuous, amid so many conflicting opinions, for us to pronounce at all upon the materials of these nests; yet we think it probable that M. Lamouroux's account comes nearest the truth. If the nests, however, are formed of *Geliadia*, they are most assuredly cemented with salivary gluten into the uniform consistency which they ultimately assume.

Esculent Swallow and Nest, from Latharius' figure.

The commercial history of these singular nests is much better understood than their composition, in consequence of their reputed virtue as a restorative. The best account of them which we have met with is given by Mr. Crawfurd. "The best nests," he says, "are those obtained in deep, damp caves, and

such as are taken before the birds have laid their eggs. The coarsest are those obtained after the young have been fledged. The finest nests are the whitest; that is, those taken before the nest has been rendered impure by the food and fæces of the young birds. The best are white, and the inferior dark-coloured, streaked with blood, or intermixed with feathers. It may be remarked, however, that some of the natives describe the purer nests as the dwelling of the cock-bird, and always so designate them in commerce. Birds' nests are collected twice a year; and, if regularly collected, and no unusual injury be offered to the caverns, will produce very equally, the quantity being very little, if at all, improved by the caves being left altogether unmolested for a year or two. Some of the caverns are extremely difficult of access, and the nests can only be collected by persons accustomed from their youth to the office. The most remarkable and productive caves in Java, of which I superintended a moiety of the collection for several years, are those of Karang-bolang, in the province of Baglen, on the south coast of the island. There the caves are only to be approached by a perpendicular descent of many hundred feet, by ladders of bamboo and ratan, over a sea rolling violently against the rocks. When the mouth of the cavern is attained, the perilous office of taking the nests must often be performed with torchlight, by penetrating into recesses of the rock, when the slightest trip would be instantly fatal to the adventurers, who see nothing below them but the turbulent surf making its way into the chasms of the rock. The only preparation which the birds' nests undergo is that of simple drying, without direct exposure to the sun, after which they are packed in small boxes usually of a picul.* They are assorted for the Chinese market into three kinds, according

* The picul is about 135 pounds.

to their qualities, distinguished into first or best, second, and third qualities. Caverns that are regularly managed will afford, in 100 parts, 53 3-10th parts of those of the first quality, 35 parts of those of the second, 11 7-10th parts of those of the third. The common prices for birds' nests at Canton are, for the first sort, 3500 Spanish dollars the picul, or twenty-nine dollars per pound; for the second, 2800 Spanish dollars per picul; and for the third, no more than 1600 Spanish dollars. In the Chinese markets a still nicer classification of the edible nests is often made than in the island. The whole are frequently divided into three great classes, under the commercial appellation of Paskat, Chi-kat, and Tung-tung, each of which, according to quality, is subdivided into three inferior orders, and we have, consequently, prices varying from 1200 Spanish dollars per picul to 4200. These last, therefore, are more valuable than their weight in silver. Of the quantity of birds' nests exported from the Indian islands, although we cannot state the exact amount, we have data for hazarding some probable conjectures respecting it. From Java there are exported about 200 piculs, or 27,000 lbs., the greater part of which is of the first quality. The greatest part is from the Suluk Archipelagos, and consists of 530 piculs. From Macassar there are sent about 30 piculs of the fine kind. These data will enable us to offer some conjectures respecting the whole quantity; for the edible swallows' nests being universally and almost equally diffused from Junk, Ceylon, to New Guinea, and the whole produce going to one market and only by one conveyance, the junks, it is probable that the average quantity taken by each vessel is not less than the sum taken from the ports just mentioned. Taking the quantity sent from Batavia as the estimate, we know that this is conveyed by 5300 tuns of shipping, and, therefore, the whole quantity will be 1818 piculs, or 242,400 lbs., as the whole quantity of Chinese

shipping is 30,000 tuns. In the Archipelago, at the prices already quoted, this property is worth 1,263,519 Spanish dollars, or 284,290*l.* The value of this immense property to the country which produces it, rests upon the capricious wants of a single people. The value of the labour expended in bringing birds' nests to market is but a trifling portion of their price, which consists of the highest price which the luxurious Chinese will afford to pay for them, and which is a tax paid by that nation to the inhabitants of the Indian islands. There is, perhaps, no production upon which human industry is exerted, of which the cost of production bears so small a proportion to the market price."*

Although we have considered birds as miners, as ground-builders, as masons, as carpenters, as platform-builders, as basket-makers, as weavers, as tailors, as felt-makers, and as cementers, we have not dwelt at much length upon any fancied analogies between their arts and those of the human race. The great distinction between man and the inferior animals is that the one learns almost every art progressively, by his own experience operating with the accumulated knowledge of past generations, while the others work by a fixed rule, improving very little, if any, during the course of their own lives, and rarely deviating to-day from the plans pursued by the same species a thousand years ago. It is true that the swallow, which doubtless once built its nest in hollow trees, has now accommodated itself to the progress of human society by choosing chimneys for nestling; and it is also to be noticed that, in the selection of materials, a great many birds, as we have already shown, accommodate themselves

* Crawfurd's Indian Archipelago, vol. iii.

to their individual opportunities of procuring substances differing in some degree from those used in other situations by the same species. These adaptations only show that the instinct which guides them to the construction of the nest best fitted to their habits is not a blind one; that it is very nearly allied to the reasoning faculty, if it is not identified with it. But that the rule by which birds conduct their architectural labours is exceedingly limited, must be evident from the consideration that no species whatever is in a state of progression from a rude to a polished style of construction. There is nearly as much difference between the comparative beauty of the nests of a wood-pigeon and of a bottle-tit, as between the hut of a North American savage and a Grecian temple. But although the savage, in the course of ages, may attain as much civilization as would lead him to the construction of a new Parthenon, the wood-pigeon will continue only to make a platform of sticks to the end of time. It is evident, from a contemplation of all nature, that the faculties of quadrupeds, birds, insects, and all the inferior animals, are stationary: those of man only are progressive. It is this distinction which enables him, agreeably to the will of his Creator, to "have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." But within their limited range the inferior animals perform their proper labours with an unwearied industry and an unering precision, which call forth our wonder and admiration. Of these remarkable qualities we have given abundant examples in the preceding pages; and they are not without moral instruction. Elevated as our minds are in the comparative scale of nature, we may still take example from the diligence, the perseverance, and the cheerfulness which preside over the *Architecture of Birds*.

DOMESTIC HABITS OF BIRDS.

CHAPTER IX.

HABITS OF CLEANLINESS IN BIRDS.

Animals appear to be cleanly in proportion to their sprightliness and activity; and small animals, with few exceptions, are also more active and more cleanly than those of a larger size. The domestic habits of birds, as well as what may be called their personal habits, furnish us with many illustrations of their peculiar attention to cleanliness, some of which it may prove interesting to detail. The instant any of their feathers are soiled they set about trimming them, and they are no less attentive to their nests.

It is, no doubt, the same uncomfortable feeling which we experience when our hair becomes disarranged or tangled that induces birds to smooth their feathers; the matting together, for example, of two contiguous feathers at the points, causing them upon every motion of the muscles of the skin to twitch away the parts from which they spring. The irritation thus produced incites the bird to examine the feathers contiguous to the part; and by nibbling every plumelet with its beak, it soon succeeds in bringing them into their proper position, while it frees them, at the same time, from any extraneous matter that may adhere to them.

It is surprising how soon nestling birds may be seen thus trimming themselves. A short time after they are able to open their eyes, while the down which covers them when hatched has not begun to

be replaced by feathers, we have in numerous instances seen them turning round their heads and going over all the tiny bits of down and the ends of the sprouting feathers within their reach. This might be plausibly supposed to be rather the mother's task, and it is usually so stated in books; but though the mother is very attentive, as we shall presently see, to every species of cleanliness, Providence has ordered that so important a circumstance should not be left wholly to her care. Those who have not an opportunity of verifying our remark in the case of nestling birds, may readily observe the same thing in domestic animals. Cats, for example, are very assiduous in cleaning the fur of their kittens, for which purpose their rough tongue is admirably adapted: but a kitten, like the nestling bird, when only a few days old, may be seen dressing itself assiduously; and as soon as it can run about, it will even endeavour to clean its dam. This circumstance we never observed among young birds and their mothers; though it is by no means uncommon among rabbits, horses, and other domestic quadrupeds. Mutual assistance in cleaning is even given by individuals not of the same family, as may be seen in horses dressing each other's necks; and Wilson relates an instance of the same thing in the case of two birds, not even of the same species, in his inimitable account of the blue jay (*Garrulus cristatus*, Brisson). An individual of this species, which had been caught in the woods, was put into the same cage with an orchard oriole (*Icterus spurius*, Bonaparte), who at first received the new comer with no little jealousy; but this all vanished in a few hours, and they lived together in good-humour. "When the jay goes to drink," the narrative proceeds, "his messmate very impudently jumps into the water to wash herself, throwing it in showers over her companion, who bears it all patiently; venturing now and then to take a sip between every

splash, without betraying the smallest irritation. On the contrary, he seems to take pleasure in his little fellow-prisoner, allowing her to peck (which she does very gently) about his whiskers, and to clean from his claws the minute fragments of chestnuts which happen to adhere to them."*

Ducks and other water-birds are, if possible, more assiduous in trimming their feathers than landbirds, one reason for which appears to be, that their plumelets being of very close texture, any slight derangement in them is readily felt from the air getting access to the skin through the breach thus occasioned. The closeness of feather in aquatic birds serves to present an impenetrable texture to the water in which they swim, as well as a smooth surface which diminishes the effect of friction in their progress.

The greater number of authors, in addition to this, tell us that birds, and more particularly aquatic birds, dress their feathers with a peculiar oil furnished for this purpose by a gland on the rump; but this is an opinion which we shall presently see admits of considerable doubt. It may be well, however, to state the particulars of the common notion. "Upon the rump," says Willoughby, "grow two glandules, designed for the preparation and secretion of a certain unctuous humour, and furnished with a hole or excretory vessel. About this hole grows a tuft of small feathers or hairs, somewhat like to a painter's pencil. When, therefore, the parts of the feathers are shattered, ruffled, or any way discomposed, the bird, turning her head backward to her rump, with her bill catches hold of the fore-named tuft, and pressing the glandules, forces out the oily pap, and therewithal anointing the disjoined parts of the feathers, and drawing them out with her bill, recomposes and places them in due order, and causes them to stick faster together."†

The recent authors who adopt this opinion would

* Wilson's Amer. Ornith., i., 15. † Ray's Willoughby, p. 3.

appear, from their taking no notice of them, to be unacquainted with the observations of M. Réaumur, which we shall abstract. The glands on the rump, he remarks, secrete an unctuous fluid, discharged in some birds by one, and in others by two excretory canals. Poultry have but one of these canals, which consists of a conical fleshy pipe of a series of rings, placed almost perpendicular to the rump; and when this gland is pressed by the fingers, the fluid, thickish in consistence, is seen to exude. But in a peculiar species of barndoor fowls, without tails (*Gallus ecaudatus*, Temminck), originally it would appear from Ceylon, the tail, the rump, and the gland are all wanting, the part where these grow in other species being depressed and smooth.

Were an attempt made to assign a reason why these Ceylonese fowls have no unctuous gland on the rump, a mistake might as readily be committed as has, it would appear, been done in the theory framed to account for the use of the gland in birds which possess it. All the works of nature being lavishly filled with wonders, fitted to raise most just admiration of the Creator, those who, with very laudable intentions, undertake to exhibit these wonders, may be considered as in some degree blameable when they introduce into their enumeration circumstances that are vague and uncertain. Among such doubtful things appears to be the opinion that the feathers of birds require to be done over with a kind of oil or grease, in order to cause the rain or other water to run off without penetrating them, the unction, when wanted, being supplied by the gland on the rump. If those who adopt this opinion, plausible as it seems to be, had taken the trouble to ascertain the small quantity of fluid actually secreted by this gland from day to day, and compared it with the proportional extent of surface constituted by the assemblage of the numberless feathers of any particular bird, not to speak of the instrument with

which the dressing is said to be effected, they would have seen at once that the theory is untenable, as the quantity secreted in one day would scarcely suffice to anoint a single feather, much less the whole. We have just squeezed out all the oil contained in the double rump-gland of a common wren, and found it impossible to make it go over one of the tail feathers. "One fact," says M. Le Vaillant, "is frequently sufficient to demolish a theory;" and the fact that the feathers of the rumpless fowls which have no gland are as smooth and proof against rain as those which possess the gland, furnishes a striking illustration of the remark.

The fact, however, is unquestionable, that birds are sometimes seen pecking about the gland in question. But the observing of a bird thus engaged, so far from authorizing the received conclusion, might have shown that the point of the bill could never squeeze out enough of fluid for the purpose alleged. The only legitimate inference would have been that some slight pain or irritation had caused the bird to peck the gland; and every schoolboy knows that the canal of this gland often becomes obstructed in his pet birds, and occasions a troublesome and sometimes fatal engorgement.

The remark of Blumenbach that the gland is largest in aquatic birds, contains a generalization not warranted by facts; for grebes, divers, and such as want tails, have the gland much smaller, though their feathers are as smooth and as impenetrable by water as those of the terns and the gulls which have considerable tails.

It is only requisite, indeed, for any one to watch a bird preening its feathers, to be convinced of the fallacy of the theory. We have attended for hours to various species of birds when thus engaged; and so far from constantly returning to the rump-gland, which by the hypothesis would be indispensable for dressing every successive feather, it is rarely visited at

all during the operation; and when it is, the sole object seems to be to trim the pencil of feathers which surrounds the gland. Had we any doubts upon the subject, the simple experiment of covering the gland in one hen or duck so as to prevent the bird having access to it, and leaving it uncovered in another, for a few days or weeks, would, by the state of the feathers in each, set the question at rest. Independently of such an experiment, common to all birds, the circumstance of the feathers on the head being equally trim, smooth, and glossy with those on the body, though they cannot be oiled, as it is impossible to reach the head with the bill—the only instrument by which the oil could be applied—is of itself fatal to the theory.

Should we be asked what we consider to be the use of the gland, we must at once say that we do not know; but our ignorance of its real use furnishes no support to the conjectural theory which the preceding facts prove to be erroneous, no less than some others connected with cleanliness which we shall now mention.

The Mohammedan Arabs of the desert, when they cannot procure water to perform the stated ablutions enjoined by the Koran, have recourse to dry sand, with which they rub their bodies as a substitute; and it is no doubt as a substitute for washing that some birds, thence called pulverizers (*Pulvinatores*), are fond of squatting in dust and hustling it into their feathers. A familiar instance of pulverizing may be observed in the barndoor fowl, even the unfledged chickens of which we have observed muddling in the dust by instinct, it should seem, as they were too young to have learned the practice from experience or by imitation. Now, had the feathers of these pulverizers been previously smeared with any unctuous matter, such as that in the rump-gland, the dust would have adhered, and thus tended to soil rather than to cleanse them.

A great number of birds are fond of washing their plumes, by throwing water over them with their beaks, and even dipping their bodies in ponds or streams. Mr. Knapp mentions the linnet (*Linaria Linota*) as the cleanliest of birds in this respect, since it delights to dabble in the water and dress its plumage in every rill that runs by; but we do not think the linnet washes more frequently than any of the other smaller birds (*Sylvicolæ*, Vieillot). The linnet, the chaffinch, and all the seed-eating birds, indeed, we have remarked to wash less frequently than the slender-billed birds (*Sylviadæ*, Vigors), to which washing seems almost as necessary as food and air.

The largest birds of prey are no less fond of washing, though they care so little for water to drink that it has been erroneously asserted they never drink. "What I observed," says the Abbé Spallanzani, "is that eagles, when left even for several months without water, did not seem to suffer the smallest inconvenience from the want of it; but when they were supplied with water, they not only got into the vessel and sprinkled their feathers like other birds, but repeatedly dipped their beak, then raised their head in the manner of common fowls, and swallowed what they had taken up; hence it is evident that they drink. For the eagle it was necessary to set the water in a large vessel, otherwise, by its attempts to drink, the vessel was sure to be overturned."

Did these birds require to oil their feathers after every washing, an immensely larger gland than any of them are furnished with would be indispensable to supply the requisite quantity; while it would prevent their feathers from being wetted at all, though this seems to be their aim in the operation, for the purpose, among other things, of getting rid of parasite insects. The head, however, which they cannot reach with their bill, and which cannot, therefore, be daubed with the oil, is the most liable to be thus in-

fected; and accordingly we often see cagebirds content themselves with wetting their heads, without touching the rest of the body. They may also be frequently seen combing or scratching their heads with their claws, no doubt with a similar design. This circumstance has given rise to a curious discussion concerning the intended use of the claws of some species, among which are the nightjar and the herons, that are furnished with small teeth like a saw or comb.

Night Heron

Wilson remarked that in specimens which he procured of the night-heron (*Nycticorax Europæus*, STEPHENS), the middle claws, serrated on the inside with from thirty-five to forty teeth, contained "particles of the down of the bird, showing evidently from this circumstance that they act the part of a comb, to rid the bird of vermin in those parts which it cannot reach with its bill."* With respect to the nightjars, Wilson gives a similar statement. His nighthawk, for instance, he says, has its "middle claw pectinated on its inner edge, to serve as a comb to clear the bird of vermin."† Again he says, "the inner edge of the middle claw of the whip-poor-will, another of the nightjars, is pectinated; and from the circumstance of its being frequently found with small portions of down adhering to the teeth, is probably employed as a comb to rid the plumage of its head of vermin, this being the principal and almost only part so infested in all birds."‡ He farther proves this in the case of the Carolina nightjar, or chuck-will's-widow, by actual observation of the fact; speaking of which species he says, "reposing much during the heats of the day, they are much infested with vermin, particularly about the head, and are provided with a comb on the inner edge of the middle claw, with which they are often employed in ridding themselves of these pests when in a state of captivity."§

The main instrument, however, by which birds trim their feathers is the bill; and if any fluid is used, it must be produced from the salivary, and not from the rump-glands. By attending minutely to the operation, indeed, the tongue may be perceived to be as actively employed as the other parts of the bill, and is certainly the organ which apprizes the bird of any rumpling or clotting of the plumelets; and when such derangement is perceived, a pause is instantly

* Wilson, Amer. Ornith., vii., 110, 2d ed.
† Ibid., v., 70. ‡ Ibid., v., 77. § Ibid., vi., 97.

made till the part is properly adjusted. We have observed a young greenbird (*Fringilla chloris*) preening its wings as they became dry after washing; and we could distinctly perceive the tongue employed both for ascertaining the parts that were rumpled, and for licking them straight when merely passing them through the bill was found to be insufficient.

That this, though it may be considered a novel statement, is notwithstanding a correct one, may be corroborated analogically by referring to the similar manner in which other animals clean themselves. Quadrupeds have no glands similar to those in birds erroneously conjectured to furnish a dressing oil; yet the greater number of quadrupeds have their fur smooth and even glossy, simply from licking it, as our young greenbird was seen to do its feathers. The cattle in our pastures may in this way be seen passing their moist tongues over their hair; and the elephant in a menagerie may be observed using the moist extremity of his proboscis to clean his rough hairless skin.

CHAPTER X.

BIRDS, SOLITARY AND GREGARIOUS, ON ACCOUNT OF FOOD.

At the moment of writing this, we can see from our study-window seven out of a flock of a score feeding so closely crowded as to have their fleeces in actual contact. And yet the field is by no means small, and other parts of it have grass equal in goodness to the corner where these seven sheep are nibbling it to the very root, while the rest of their companions are only at a few feet distance, in the same quarter of the field.

In order to arrive at the cause of this sociality, which seems not only to be without any reasonable motive arising from mutual advantage, but to be rather disadvantageous from the pasture being exhausted by the crowd of feeders, we must consider these sheep as domesticated, and, of course, in different circumstances from the species in their original state of wildness and freedom, in which such sociality may serve some important purpose. The sheep of mountainous countries, where they are in a state of comparative wildness, though unconfined by fences, like those in the meadow just alluded to, are observed to keep together in bands, and to pass from one mountain platform to another in regular ranks, one deep, always headed by a leader. The duty of this leader is to give warning of the approach of danger to his troop, both when on a march of removal to a different pasture and also while they are feeding. This fact, which has often been recorded, we have had more than once an opportunity of witnessing in Wales. On ascending Snowdon, for example, our attention was attracted by the deep harsh *krroup* of a raven sailing about on the air, looking out, no doubt, for some luckless sheep enfeebled by accident or disease upon which he might pounce. Immediately from the shoulder of the mountain above us the note of the raven was answered by the alarm-call of the leader of a small flock of sheep who were feeding on the scanty herbage of this lofty region; and, at the signal, they quickly drew closer together, and, forming a "serried phalanx," eyed their enemy with a bolder bearing than we could have deemed possible in animals proverbial for timidity. The raven was not long in discovering that he had little chance of singling a victim from so watchful and wary a band, and flew off towards the neighbouring cliffs, where he might chance to light upon the carcass of one left undevoured by some fox scared from his prey, or

accidentally precipitated, as we have seen happen, from the rocks above. On the departure of their enemy, the sheep began to feed again, but warily at first, raising their heads at intervals to assure themselves that he was really gone; while, to render assurance doubly sure, their leader again took his station as sentinel for the common weal.

Now we are disposed to conclude, that these two cases of the sheep and the raven may, so far as food is concerned, be taken as the general conditions of the solitary and gregarious habits of birds. One whose food is confined to living prey will prowl alone, because along with associates he might fare scantily; while those who feed on seeds and other vegetable substances, easily obtained in abundance, congregate that they may feed more safely, by appointing, as the mountain sheep do, a sentinel to warn them of danger. The raven, indeed, can hardly be looked upon as subsisting wholly on living prey. It is not furnished by nature with sufficiently formidable weapons for this purpose; and almost uniformly, when carrion cannot be obtained, it attacks lambs, sickly sheep, or such as have fallen into a ditch or bog, perching on the head and pecking out the eyes. In temperate climates, birds that prey on carrion are less necessary as scavengers than in tropical countries, where flocks of vultures collect together from distances that have astonished all observers by whom the circumstance is recorded. The gregariousness of these birds, however, may be plausibly referred to the wise care of Providence to have offensive carcasses speedily removed; and it is manifestly with this design that such birds are endowed with extremely acute senses, either of vision or of smell, probably both, so as to enable them to discover carrion afar off.

This is well exemplified in two species, which have been frequently confounded, the Turkey buz-

Turkey Buzzard and Black Vulture.

zard (*Catharista aura*, VIEILLOT) and the black vulture (*C. Urubu*, VIEILLOT), both of which are looked upon as so useful that there is a considerable penalty for killing them. "The great number of these birds"

(*C. Urubu*), says Ulloa, "found in hot climates, is an excellent provision of nature; as otherwise the putrefaction caused by the constant and excessive heat would render the air insupportable to human life. These birds are familiar in Carthagena; the tops of the houses are covered with them: it is they who cleanse the city of all its animal impurities. There are few animals killed whereof they do not obtain the offals; and when this food is wanting, they have recourse to other garbage." The following account of the same bird is in Wilson's best manner.

"A horse had dropped down in the street in convulsions, and, dying, it was dragged out to Hampstead and skinned. The ground for a hundred yards around it was black with carrion crows; many sat on the tops of sheds, fences, and houses within sight; sixty or eighty on the opposite side of a small run. I counted at one time two hundred and thirty-seven, but I believe there were more, besides several in the air over my head, and at a distance. I ventured cautiously within thirty yards of the carcass, where three or four dogs and twenty or thirty vultures were busily tearing and devouring. Seeing them take no notice, I ventured nearer, till I was within ten yards, and sat down on the bank. Still they paid little attention to me. The dogs, being sometimes accidentally flapped with the wings of the vultures, would growl and snap at them, which would occasion them to spring up for a moment, but they immediately gathered in again. I remarked the vultures frequently attack each other, fighting with their claws or heels, striking like a cock, with open wings, and fixing their claws in each other's head. The females, and, I believe, the males likewise, made a hissing sound, with open mouth, exactly resembling that produced by thrusting a redhot poker into water; and frequently a snuffling, like a dog clearing his nostrils, as I suppose they were theirs.

On observing that they did not heed me, I stole so close that my feet were within one yard of the horse's legs, and again sat down. They all slid aloof a few feet; but seeing me quiet, they soon returned as before. As they were often disturbed by the dogs, I ordered the latter home; my voice gave no alarm to the vultures. As soon as the dogs departed, the vultures crowded in such numbers, that I counted at one time thirty-seven on and around the carcass, with several within; so that scarcely an inch of it was visible. Sometimes one would come out with a large piece of the entrails, which, in a moment, was surrounded by several others, who tore it in fragments, and it soon disappeared. They kept up the hissing occasionally. Some of them, having their whole legs and heads covered with blood, presented a most savage aspect. Still, as the dogs advanced, I would order them away, which seemed to gratify the vultures; and one would pursue another to within a foot or two of the spot where I was sitting. Sometimes I observed them stretching their necks along the ground, as if to press the food downward."*

But it may be remarked, that in all the accounts given of these gregarious vultures, nothing is said of their appointing a sentinel like the mountain-sheep, or like several species of birds to which we shall presently attend. For this, however, there is the obvious reason, that the vultures have no formidable enemies, being protected by man to serve his convenience, besides that, like the mole, they seem to be too disgusting to be preyed upon by any animal.

Other gregarious birds, however, may be observed always to have a sentinel stationed near them while feeding, whose office it is to give timely alarm of threatening danger or indications of its approach.

* Amer. Ornith., ix., 107.

When a flock of sparrows, accordingly, alight in the corner of a wheatfield, and, as Bloomfield says,

"Drop one by one upon the bending corn,"*

we may always be certain of discovering one, or perhaps several, perched on some commanding station in the adjacent hedgerow, prying into the probable design of every movement among men or animals which lie within ken of the watch-tower. The instant the sentinel perceives anything which he deems worthy of notice, he gives his well-known signal, at which the whole flock hurry off from their banquet with the utmost celerity and trepidation. Their fears are, for the most part, only momentary; for, as soon as they ascertain that there is no immediate danger, they hasten back to finish their meal.

From all we have been able to observe, there does not seem to be anything like an election or appointment of such sentinels. The fact appears rather to be, that, probably from being less impelled by the calls of hunger, the bird of the flock who chances to be the last in venturing to alight, feels then reluctant to join his companions, in consequence of an instinctive foresight that they might all be thence exposed to danger. We only offer this, however, as a plausible conjecture, which appears more applicable to the case of sparrows than to that of some other gregarious birds. Were we disposed, indeed, to indulge in the fancies sometimes found in books of natural history, we might give the sparrows credit not only for appointing sentinels, but for trying them for neglect of duty by a regular court-martial.

Sparrow-courts, or assemblies of sparrows for some common object regarding one of their community, are of frequent occurrence; and, in truth,

* Farmer's Boy.

they can scarcely escape the observation of any one who attends to the habits of animals. The birds usually select a spot somewhat remote from their usual haunts, such as the centre of a copse or the edge of a wood, where they may be seen crowding closely around one of this number, and scolding him in all the terms of their vocabulary. Whether they proceed from verbal reproof, however, to corporeal chastisement, we have never ascertained; for they are so jealous, on such occasions, of intruders, that they immediately stay process and break up their court, should a prying naturalist venture within the precincts. Descriptions precisely analogous have been given by different authors of assemblies of rooks, or *crow-courts*, as they are called. In the latter, however, if we may believe what is reported, there is a regular trial of a delinquent, who, upon being found guilty, receives a severe drubbing from the whole court, and is even sometimes killed outright.*

Pliny reports something similar to this as occurring among storks. "There is a place," he says, "in the open plains and champaign country of Asia Pithonas-Come, where (by report) they assemble altogether, and, being met, keep up a jangling one with another; but, in the end, look which of them lagged behind and came tardy; him they tear in pieces, and then depart."†

It is not improbable, we think, that this legend (for it can be nothing more) of the crow-courts has originated in the quarrels which take place when rooks are building their nests, in consequence of their propensity to pilfer. In such cases, as Goldsmith records from his own observation, "thefts never go unpunished; and probably, upon complaint being made, there is a general punishment inflicted;

* Landt, description of the Feroe Isles.
† Holland's Plinie, x., 23.

I have seen," he adds, " eight or ten rooks come, upon such occasions, and setting upon the new nest of the young couple, all at once tear it in pieces in a moment. Such is the severity with which even native rooks are treated; but if a foreign rook should attempt to make himself a denizen of their society, he would meet with no favour: the whole grove would at once be up in arms against him and expel him without mercy."*

Rooks, if we may judge from our own observation, are more particular even than sparrows in the circumstance of having sentinels while they are feeding in parties after the breeding season; for while providing for their young family, they, in general, cater apart. These rook sentinels are so vigilant, that it is by no means easy to get within shot of a foraging party; and hence it is popularly believed that rooks can smell gunpowder. We have often proved, however, that it is just as difficult to approach them without alarming the sentinels, when only carrying an umbrella, as when armed with a fowling-piece; but that they seem to have some knowledge of firearms appears from their being alarmed if a walking-stick is levelled at them, though no noise is made; a knowledge most probably acquired by the reiterated experience of having their nest-trees fired at when the young are fit to be made into pies. It is stated in some accounts of newly-discovered countries, that the birds were not at first frightened by the presentment of a fowling-piece, but soon became so after some experience of its effects. We also think it not unlikely that the crows acquire part of the skilful vigilance which they exhibit as sentinels during the building of their nests, when one of a pair usually watches the nest while the other makes excursions to procure materials.

* Animated Nature, iii., 168.

The sentinels of gregarious birds were observed by the ancients, and legends told of them no less exaggerated than those of our modern crow-courts. "The cranes," says Aristotle, as we may translate

Crane.

the passage, "have a leader, as well as sentinels placed in their rear rank, so that their alarm-call may be heard."* Pliny gives a still more minute detail of their proceedings. Speaking of their migration, he

* Hist. Anim., ix., 10.

says: "They put not themselves in their journey, nor set forward without a council called before, and a general consent. They flie aloft, because they would have a better prospect to see before them; and for this purpose a captain they chuse to guidè them, whom the rest follow. In the rereward behind there be certain of them set and disposed to give signal by their manner of cry, for to range orderly in ranks, and keep close together in array: and this they do by turns, each one in his course. They maintain a set watch all the night long, and have their sentinels. These stand on one foot, and hold a little stone within the other, which, by falling from it if they should chance to sleep, might awaken them, and reprove them for their negligence. Whiles these watch, all the rest sleep, couching their heads under their wings; and one while they rest on the one foot and otherwhiles they shift to the other. The captain beareth up his head aloft into the air, and giveth signal to the rest what is to be done."

Authors also tell us that the quails have a king to conduct their migrations; and it is farther pretended that they are shrewd enough not to select for a monarch one from their own body, but make choice of a landrail (*Ortygometra Crex*); for, upon coming to their place of destination, the first of the band usually falls a victim to some bird of prey that is waiting their arrival, and, foreseeing this, the quails contrive to provide a victim from another species. Such legends, as Buffon well remarks, by ascribing incredible sagacity and design to birds, give us good room to doubt whether the authors themselves possess any great share. As the landrail, however, migrates about the same period with the quails, this is not quite so extravagant a notion as that recorded by Aristotle, that the quails are led by an owl as their king.

M. Vaillant remarks, that the idea of these king-

birds seem to have originated from the casual observation of a strange species among a flock of gregarious birds. He once observed a few crossbills (*Loxia curvirostra*) in the king's garden at Paris, intermingling with other gregarious birds. These, being uncommon birds, were very likely to attract popular attention, and give rise to the fancy of their being royal birds. He once also noticed a fieldfare (*Turdus pilaris*), which, having strayed from its companions and associated with starlings, was called king of the starlings by the peasants of Sezaune, in La Brie.

King of the Vultures.

A similar custom is that of the king of the vultures (*Sarcoramphus papa*, DUMERIL), which is sel-

dom seen congregating in flocks, but of whom one or two solitary birds will intermingle with the Turkey buzzard (*Catharista aura*, VIEILLOT), and, of course, appear conspicuous among them from their more striking form and colours.

It is not improbable that similar solitary habits in the lion and the eagle, together with their magnitude and their strength, have given origin to the titles of king of the beasts and king of the birds, current all over the world. "The eagle," says Jonston, "challengeth the first place, not that it is the best dish at table, for none will eat it, but because it is the king of the birds."* The ancient Greeks used the same term, as we find Pindar talking of "the great eagle, the chief magistrate of the birds."† Josephus, the Jewish historian, also says the eagle was selected for the Roman legionary standards, because he is "the king of all the birds and the most powerful of them all, whence he has become the emblem of empire and the omen of victory;"‡ and this conclusion is singularly enforced by Aldrovand, who tells us that the eagle "challenges dragons to battle and fights with them; attacks bulls and slays them;" adding the anti-climax that "he overcomes leverets, tears foxes, and feeds upon snakes."§

"Caius Marius," says Pliny, "in his second consulship, ordained that the legions of Roman soldiers only should have the eagle for their standard, and no other ensign; for before-time the eagle marched foremost indeed, but in a ranke of four others, to wit, of wolves, minotaurs, horses, and boars, which were borne each one before their own several squadrons and companies. Not many years past, the standard of the eagle alone began to be advanced into the field of battle, and the rest of the ensigns were left

* Miracles of Nature, Englished by a Person of Quality, p. 167, fol., Lond., 1667.

† Ode vi., Isthmior. ‡ Josephus, De Bello Judico, iii., 5.

§ Ornothologia, i., 10.

behind in the camp; but Marius rejected them altogether, and had no use of them at all. And ever since this, is observed ordinarily, that there was no standing camp or leaguer wintered at any time without a pair of eagle standards."*

Josephus and Pliny, however, were wrong if they thought the ensign of the eagle peculiar to the Romans; for the golden eagle with extended wings was borne by the Persian monarchs,† from whom it is probable the Romans adopted it, as it was subsequently adopted from them by Napoleon and the United States; while the Persians themselves may have borrowed the symbol from the ancient Assyrians, in whose banners it waved till Babylon was conquered by Cyrus. This may serve to explain why the expanded eagle is so frequently alluded to in the prophetical books of Scripture.‡ Referring, for example, to the king of Babylon, Hosea says, "he shall come as an eagle;"◊ and Ezekiel describes Nebuchadnezzar as "a great eagle, with great wings, long-winged, full of feathers which had divers colours;" and the king of Egypt as "another great eagle, with great wings and many feathers."‖ It was, no doubt, on the same account that the eagle was assigned in the ancient mythologies as the bird of Jove, a notion which Lucian, with his usual satire, ridicules without mercy, making Momus tell Jupiter he may think himself well off if it do not take a fancy to build a nest on his head.¶

So far as size and appearance are concerned, as well as in power of flight, the eagle (*Aquila chrysaëtos*, KLEIN) must yield the palm to the condor of America (*Sarcoramphus gryphus*, DUMERIL), while the head of the latter, "the likeness of a kingly crown has on." The condor, however, has not the honour

* Holland's Plinie, x., 4.
† Xenophon, Cyrop., vii.
‡ Paxton, Illus. of Scrip., ii., 13.
◊ Hosea, viii., 1.
‖ Ezek. xvii., 3–7; and La Roque, Voyage.
¶ Θεων Εκκλησιᾳ, 8.

Condor attacking a Puma.

of ranking among eagles, being evidently, both from structure and habits, nothing but a vulture.

We can readily understand why the least of our British birds, the gold-crested wren (*Regulus christatus*, RAY) should have been considered a royal bird in most countries, from its having a fine coronet of a bright gold-colour on its head, as Aristotle correctly remarks.* But why the common wren (*Anorthura communis*) should be called a king-bird, we cannot conjecture, except it has been from irony or antiphrasis, in the same way as M. Hebert tells us it is called the ox (*bœuf*) in some provinces of France. From being unable to account for the lat-

* Hist. Anim., viii., 3.

ter fact, Gesner, Willoughby, and other naturalists, accuse Belon, Brisson, and Oliva, of confounding the two species. To us, however, this charge appears groundless, for Aristotle very clearly distinguishes the two birds; and yet he says the gold-crested one is called a king (*τυραννος*), and the common one (*τροχιλος*) also is called a magistrate and king (*πρεσβυς και βασιλευς*), "for which reason," he adds, "the eagle is said to fight with it."* Independently of this authority, the popular titles given to the common wren, in most languages, by the peasants who know nothing of the disputes of naturalists, prove that there must be some cause for the term unconnected with any confusion of the species. For example, the Italians call it the little king (*reattino*), the king of the hedge (*re di siepe*), the king of the birds (*redegli uccelli*); the Spaniards, the kinglet (*reyezuelo*); the Portuguese, the bird-king (*ave rei*); the French, the little king (*roitelet*), or king-berry (*roi-berry*), or the king of cold (*roi de froidure*); and the Germans, the snow-king (*schnee-könig*), and thorn-king (*thurn-könig*). At the same time, we are aware that the gold-crested wren has obtained similar titles, such as in Italy, the little pope (*papazzino*); in Germany, the kinglet (*königchen*); and in Sweden, kingbird (*kongs-vogel*). We pretend not to account for the universal diffusion of the same notion, but it is most evident it does not arise from the mistake that has been supposed.

It would appear to originate from the singularly solitary habits of the jack-snipe (*Scolopax gallinula*), that young sportsmen are disposed to take it for the male of the common snipe (*S. gallinago*), though it is so very different in size and even in plumage. "The jack-snipe," says Mr. Knapp, "is a solitary, unsocial bird, an anchorite from choice. With the exception of our birds of prey, the manner of whose

* Hist. Anim., ix., 2.

Jack Snipe.

existing requires it, and a few others, all the feathered tribe seem to have a general tendency towards association, either in flocks, family parties, or pairs; but the individuals of this species pass a large portion of their lives retired and alone, two of them being rarely, or, perhaps, never found in company, except in the breeding season.*

Similar remarks may be applied to the sandpiper (*Totanus hypoleucos*, Temminck), which is so solitary in habit that we have seldom observed two of them together, even during the breeding season; though individuals are very frequently seen tripping along the sands by the sides of lakes and rivers, in pursuit of water-insects, which they capture by speed of foot, seldom, if ever, taking wing to continue the pursuit, as is often done by their fellow-hunter the wagtail (*Motacilla lotor*). We are not aware that they congregate, even during their migrations.

From the foregoing details of the solitary and

* Journal of a Naturalist, p. 253.

social habits of birds, it would seem that their sociality produces no apparent result, except it may be the appointment of a sentinel to give intimation of danger, if indeed such appointment (as may well be doubted) actually takes place. Except in the instance of the sociable grosbeak (*Loxia socia*) of Africa, we do not recollect any authentic instance of birds uniting their efforts to assist in performing a common work. Even in this instance, the accurate observations of M. Vaillant have proved, that so far from building streets, as Paterson and others represent these birds to do, they merely build their nests in actual contact, as rooks may sometimes be observed to do in this country. The notion of their building streets is of the same character with Pliny's account of the swallows in Egypt raising an embankment to oppose the inundation of the Nile, adopted by him from some hasty observer who had seen the bank-swallows (*Hirundo riparia*), not building (as he supposed), but mining into an escarpment of the river. In the same way we find it related by authors of celebrity, that when a pair of sparrows take felonious possession of the nest of a swallow, the swallow summons its companions to its assistance, when they all unite in a body to bring a sufficient quantity of mortar to entomb the robber-sparrows alive in the nest. This story is obviously imaginary, and the fiction is shown from the impossibility of so entombing, by means of clay, a bird with so powerful a bill as the sparrow.

M. Dupont de Nemours gives the following singular account of what fell under his own observation: "I remarked," he says, "a swallow which had unhappily, and I cannot imagine in what manner, slipped its foot into a slipknot of packthread, the other end of which was attached to a spout of the College of the Four Nations. Its strength was exhausted; it hung at the end of the thread, uttered cries, and sometimes raised itself as if making an

effort to fly away. All the swallows of the large basin between the bridges of the Tuileries and the Pont Neuf, and perhaps from places more remote, had assembled to the number of several thousands. Their flight was like a cloud; all uttered a cry of pity and alarm. After some hesitation and a tumultuous counsel, one of them fell upon a device for delivering their companion, communicated it to the rest, and began to put it into execution. Each took his place; all those who were at hand went in turn, as in the sport of running at the ring, and, in passing, struck the thread with their bills. These efforts, directed to one point, were continued every second, and even more frequently. Half an hour was passed in this kind of labour before the thread was severed and the captive restored to liberty. But the flock, only a little diminished," adds M. Dupont de Nemours, "remained until night, chattering continually in a tone which no longer betrayed anxiety, and as if making mutual felicitations and recitals of their achievement."

Now we doubt not that these swallows crowded to their companion, as M. Dupont has recorded, for all small birds are apt to come when called by their fellows, as is well known to birdcatchers, who employ callbirds to bring the wild ones to their nets; but we much doubt whether they united their efforts with the design of cutting the string, and think the observer must have been deceived as to this particular. In a similar instance of a pair of sparrows becoming entangled, which fell under our observation, their neighbours crowded to the place, but, apparently, only for the purpose of scolding, not of assisting the entangled birds.

It is rare indeed among quadrupeds, and rarer still, if it occur at all, among birds, to meet with instances of mutual assistance, such as we find so strikingly exemplified among social insects. Beavers unite in forming dams across a stream and in

burrowing out chambers in the banks; but stories are told of the mutual assistance of other quadrupeds, evidently as much overcoloured as that of M. Dupont's swallows.

The only obvious and decided instance of mutual assistance, which we recollect as occurring among birds, is that of parents feeding their young, keeping them clean and warm, and defending them against enemies. But in order to secure warmth, many species certainly take advantage of the animal heat of their kindred, and we may with some plausibility say, that in most cases this is done by mutual sufferance, if not by distinct permission.

It is one of the most extraordinary, as well as one of the best ascertained facts in the animal economy, though by no means, as yet, satisfactorily explained, that the interior heat of warm-blooded animals varies extremely little in the coldest and in the hottest climates.

This law, by which animal temperature is maintained at nearly the same degree on exposure to considerable heat or cold, supplies the only known reason why some of the smaller and seemingly tender animals outlive the rigours of the severest winters. The magpie (*Pica caudata*, Ray), though rather a hardy bird, has been found having recourse to what is often practised by smaller birds, several of them huddling together during the night, to keep each other warm. A gentleman of intelligence and veracity informed us that he once saw a number of these birds (probably a young family with their parents) on a tree, in a fir plantation, sitting so closely together that they all seemed to be rolled up into a single ball.

It is a very curious and remarkable circumstance, that many species of birds which are solitary at one period of the year, are gregarious at another; and though it is possible to account for this in some instances, it becomes not a little difficult in others.

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The lark, during the summer months, is decidedly unsocial; for though we may meet with two or three pairs in the same field, we seldom find their nests near each other. They are not quarrelsome and pugnacious, like the redbreasts, but they seem to prefer a secluded spot to a crowded neighbourhood. The young larks, after leaving their nest, seem equally unsocial, and do not, like most nestlings, keep together in a band, but prefer to wander about the field by themselves, though this must increase the trouble of their parents in bringing them food. Yet these seemingly unsocial birds, as soon as the breeding season is fully over, flock together in numbers almost incredible, and have then been caught for the table in most countries of Europe from the earliest times, as in Greece, Italy, and England. The numbers taken in France may be guessed at from the account of Montbeillard, who says, "a hundred dozen or more are sometimes taken at once, and it is reckoned very bad sport when only twenty-five dozen are got."

What we have said of larks will nearly apply to linnets, chaffinches, the two house-swallows, and several other species, which breed in solitary pairs, and congregate at the approach of winter. It is worthy of remark, that most, if not all, of these broods are more or less migratory, either leaving the country altogether, or shifting from one district to another; and, looking at the facts in this point of view, we may plausibly conjecture that the young broods take advantage of the experience of the older birds in removing to a more genial climate, or to places more abounding in food.

CHAPTER XI.

PAIRING OF BIRDS.

It would not be easy to select a more striking instance of the wisdom displayed in regulating the works of creation, than the extraordinary, and, to us, inexplicable fact of the males and females of all animals being always found in nearly the same proportional numbers. With respect to mankind, for example, it has been proved, by taking a census of the population in different countries, that the ratio of the two sexes shows very little variation. Hufeland found that in Germany there are about twenty-one males to twenty females; and by the population returns for England and Wales from 1811 to 1820, the number of males born was 1,664,557, and of females, 1,590,510. It has been inferred that the uniform excess of male births is providentially designed to meet the greater mortality arising from men being, by their habits of life, more exposed to dangers. No physiological investigation hitherto attempted has been successful in elucidating the more immediate causes of these wonderful facts, though some of the laws by which they are regulated have recently been successfully traced by the curious experiments of M. Girou de Buzareingues, who found, that with respect to the ages of the individuals paired, and the proportion of the sexes produced, nearly the same principles held good among fowls as among quadrupeds, at least when both were domesticated.

The males of quadrupeds seldom lend any assistance whatever in taking care of the young. The assistance of the male, indeed, in most animals which suckle their young, is not at all wanted, and hence he seldom takes any notice, or even knows of

the existence, of his offspring. Among insects there is still less need of the aid of the male, so far at least as food is concerned; for very few insect parents live to see their offspring. Insects, in most cases, finding their own food as soon as they are hatched, it is the chief care of the mother to deposite her eggs where appropriate food may be readily obtained by her progeny. Food, indeed, is in some instances collected by the mother and brought to the place where her eggs are deposited; but the male parent never shares either in the labour of procuring it or in the construction of the nest for its reception; while in the singular exceptions furnished by ants and other insects living in communities, neither the males nor the females, but a peculiar race of nurse insects, provide the necessary food for the young. Among birds, on the other hand, food for the young has in most instances to be brought from a distance, and much assiduity is required to collect it in sufficient quantity, the voracity of nestlings being almost insatiable. Among them, therefore, the assistance of the male in this work is in most species almost indispensable. When the brood is numerous, it would be extremely difficult, if not impossible, for the female alone to procure the requisite supply. Rooks, for example, which feed their young upon the grubs of chafers and similar insects, have often to make long excursions from their nest-trees before they can find the required prey; and if this task were assigned to the female alone, she could not obtain enough to sustain her own wants and the incessant cravings of five young ones, which will readily devour their own weight of food in the course of a single day. Accordingly, when the rooks, as they sometimes do, build a second nest late in the season, in consequence of the first being destroyed, they find it scarcely possible to rear their young; the warmth of the advancing summer drying up the ground, and

forcing the grubs and worms so deep into it as to be out of reach, while, the operations of ploughing and digging having almost ceased, they have little aid from the labours of man. In such cases it has been remarked, that "the constant clamour of the young for food, so unusual in nestling birds, renders it manifest that the labours and exertions of the parents cannot supply a sufficiency for their requirements."* If, then, the difficulty is so considerable when both parents conjoin their labours, it may be inferred that it would, even in ordinary circumstances, be too much for the female alone, more particularly as her energies must be somewhat impaired by the previous fatigue undergone in the process of hatching. During this process the aid of the male is no less indispensable than in feeding the young.

It is obvious, that while the hen has to sit for a number of days in order to hatch her eggs, and cannot, as we shall afterward see, leave them for many minutes without incurring the risk of destroying the embryo chicks, she must either run this hazard or perish of hunger, unless she had food brought to her. This, indeed, may be considered as almost the commencement of the labours of the male bird; for, though he helps a little in the building of the nest, he does not work at it with the unwearied assiduity of the female. In the instance of the capocier (*Sylvia macroura*), Vaillant tells us that he observed the female to be much more active and anxious about the building than the male, even punishing him for being frolicksome and idle by pecking him with her beak; while, in revenge, he would sometimes set about pulling portions of the nest to pieces.

Independently, then, of assisting to build the nest, the female evidently could not well perform her

* Journal of a Naturalist, p. 259, 3d edition.

domestic duties if left to her own efforts; though among polygamous birds, as we shall subsequently notice, this remark requires to be taken with some modification. The instinct, or whatever it may be called, which leads birds to anticipate, foresee, and provide for this necessity, we cannot, in our present state of knowledge, trace to its immediate causes; and we must, therefore, rest contented with the knowledge of the observed facts. Some of these are not a little interesting, particularly on account of the close resemblance of the proceedings of birds to our own; a resemblance that does not hold with those of other classes of animals.

It might be supposed that birds of prey would be in the first instance somewhat afraid of each other in their preliminary communications; at least an entomologist would readily suppose so, from knowing that it is no uncommon thing among predacious insects for the females to make prey of the males, even after pairing. Birds of prey, however, though, when pressed by hunger, they might not refuse to destroy their own species, are not, like spiders, actuated by indiscriminate cannibal voracity; and though some of the more powerful eagles (*Haliætus leucocephalus*, Savigny, &c.) will pursue their congeners and force them to surrender the prey they may have caught, yet we are not aware of any recorded instance of one eagle making prey of another, as spiders are known to do, and as is common among fish. On the contrary, the males and females of birds of prey appear to be more closely attached than those of most other species. They continue together not only during the breeding season, but throughout the year, and even for a long succession of years, at least if we may trust to the circumstantial evidence of a pair of eagles frequenting the same locality and building on the same spot.

The evidence, indeed, for the birds being always

Whiteheaded Eagle and Fish-hawk.

the same is incomplete; yet, on the supposition that it is not the same, but successive pairs, which are observed in the same place, we are led to the curious inquiry how the death or disappearance of one pair is supplied by another. We have in more than one instance observed a pair of magpies nestle on the same tree for a series of years, where they reared a brood of four or five young ones every season. All of these disappeared from the neighbourhood; at least, we observed no increase in the number of nests. In one instance we observed a magpie's nest thus successively occupied for ten years.

The continuance of a nest in the same spot for several years is more remarkable in the case of migratory birds than in that of magpies, which do not migrate, and seldom go to any considerable distance from their breeding trees. There has been, in a garden adjacent to ours, the nest of a black-cap (*Sylvia atricapilla*) for a succession of years, and broods have been successively reared there, without any observable increase in the population of the species. Yet this bird, which is little bigger than a wren, weighing only half an ounce, has to traverse annually the whole of the south of Europe, and probably a great proportion of the north of Africa, exposed, of course, to numerous accidents, as well as to occasional scarcity of its appropriate food. From the regular annual restoration, however, of this nest at the same spot, it is obvious that one, if not both of the black-caps, must have been wont to perform this extensive migration to and from Africa as safely as the more hardy cuckoo or the more swift-winged swallow. During the spring of 1831, the back-caps, which we suppose to be the same birds, from their keeping to the same place of nestling, were more than usually late in arriving; for in another garden about a mile off there were young in the hereditary nest of black-caps

before our little neighbours made their appearance from the South. When they did arrive, their attention was immediately attracted by the unusual circumstance of hearing the loud song of a rival in the vicinity of their premises. This was a male black-cap, which we had purchased the preceding autumn in the bird-market at Paris, and which was daily hung out in his cage to enjoy the fresh air and the sunshine, within a gunshot of their usual place of nestling. The wild birds did not appear to like the little stranger at all; and the male kept flying around the cage, alternately exhibiting curiosity, fear, anger, defiance, and triumphant exultation. Sometimes he would flit from branch to branch of the nearest tree, silently peeping into the cage with the utmost eagerness; all at once he would dart off to a great distance, as if afraid that he was about to be similarly imprisoned; or, getting the better of his fears, he would perch on a conspicuous bough and snap his bill, calling *check, check,* seemingly in a great passion; again he would sing his loudest notes by way of challenge, or, perhaps, meaning to express his independence and superiority. Our cage-bird, meanwhile, was by no means a passive spectator of all this; and never failed, on the appearance of the other, to give voice to his best song and to endeavour to outsing him, since he could not get at him to engage in personal conflict.

This sort of altercation continued for more than a week; but the wild bird became gradually less eager to pry into the cage or to take any other notice of the cage bird, and at length ceased altogether to approach it, his attention being now wholly occupied in attending to his mate, and aiding her in building her nest. It is worthy of remark, that though, on their first appearance, they resorted to the garden where the nest had hitherto been built, they finally fixed their residence in another garden at some distance, induced no doubt by the vicinity of

our cage-bird to their former haunts. The distance of the place to which they removed is such, that we can readily hear the song of the male, and our bird is no less eager to answer and to endeavour to outsing him than at first; while it is worthy of remark, that the wild bird seems no longer interested in such rivalry, and sings as if his only concern was to please himself and his mate.

Now we think it a very probable inference, from this little narrative, that, had the wild male blackcap by any accident been killed, the hen would have readily paired with our bird or any other which had made its appearance; for it must have been the natural dread of her preferring our bird, that actuated him in his various expressions of passion which we have just recorded. This conclusion is corroborated by his subsequent behaviour as soon as he felt secure in the affections of his mate by her commencing the nest under his own auspices.

About the same period of time we had an opportunity of observing the proceedings of some other cage-birds of different species in their preparations for breeding. It is well known to be a common practice among bird-fanciers to pair hen canaries with males of other species of the same genus, or such as resemble them the nearest in size and habits; and as we possessed two such males in a goldfinch and a siskin (*Carduelis spinus*, Brisson), we put them both into a large breeding-cage along with a hen canary. It was not a little amusing to observe the exertions of these two birds in trimming their feathers, singing at the utmost pitch of their voices, as if each were determined not to be outsung by his rival; and more than once, before any nest was begun, we observed them bringing her food in their bills by way of present. From the first, however, she showed a marked dislike to the goldfinch, though the finest beau of the two, being the brightest coloured bird even of this beautiful species we ever

saw; while the siskin, independently of his less gay colours, had lost his tail, and was, besides, quite bald, from the habit he had of rubbing his head along the wires of the cage. With all these disadvantages, nevertheless, in the personal appearance of the siskin, added to his inferiority of song (rendered worse by the harsh cackling note which he seldom failed to give as a finale to his most melodious passages, contrasting strongly with the merry musical *twinkle* of the goldfinch's finale), the latter received nothing for his assiduities but a loud scolding, or, sometimes, a hearty drubbing, the canary being by far the most powerful bird, and being never loath to let him feel the sharpness of her beak. The siskin being evidently the favourite, we had the goldfinch removed; but as his cage was hung up near the other, he continued to give himself all the airs which had already proved so unavailing. But the siskin, precisely like the wild black-cap already mentioned, almost immediately relaxed in his assiduities to please; and, though he was not inattentive during the incubation which followed, yet he seldom strove to outsing the goldfinch, but warbled in a subdued, under tone of voice, as much as to indicate that he cared not how well or how loud his old rival might now sing.

Montagu was of opinion that birds which have not paired wander about continually till they find a mate, in support of which he adduces several curious facts which fell under his observation. In the instance of the nightingale, if by accident the female is killed, the male, who has become silent about the end of June, will resume his song and will continue to sing late in the summer or till he finds another mate. "This," continues Montagu, "we have proved by taking the female on her nest, when the mate assumed his usual vociferous notes, which attracted another female." It would appear, indeed, that in birds which pair, nature has pro-

duced nearly an equal number of both sexes; and yet, if either the male or the female be killed before breeding, the remaining bird usually finds a second mate. The male of the migrative species Mantagu thinks never quits the place he first resorts to, but attracts the females by his song; and hence, he conceives, it is probable that such females as have not at first paired, or lost their mates by accident, continually wander about in search of another.

We have a similar instance to those mentioned by Montagu recorded by Professor Kalm. "A couple of swallows," he says, "built their nest in a stable, and the female laid eggs in the nest, and was about to brood them. Some days afterward the people saw the female still sitting on the eggs; but the male, flying about the nest, and sometimes settling on a nail, was heard to utter a very plaintive note, which betrayed his uneasiness. On a nearer examination, the female was found dead in the nest; and the people flung her body away. The male then went to sit upon the eggs; but, after being about two hours on them, and perhaps finding the business too troublesome, he went out, and returned in the afternoon with another female, which sat upon the nest, and afterward fed the young ones till they were able to provide for themselves.

That it is not the male alone, however, which is thus able to procure a second mate, appears from the remarks of White. "Among the monogamous birds," he says, "several are to be found, after pairing time, single, and of each sex; but whether this state of celibacy is matter of choice or necessity is not so easily discoverable. When the house-sparrows deprive my martins of their nests, as soon as I cause one to be shot, the other, be it male or female, presently procures a mate, and so for several times following. I have known a dovehouse infested by a pair of white owls, which made great havoc among young pigeons. One of the owls

was shot as soon as possible; but the surviver readily found a mate, and the mischief went on. After some time the new pair were both destroyed, and the annoyance ceased. Another instance, I remember, of a sportsman, whose zeal for the increase of his game being greater than his humanity, after pairing time he always shot the male bird of every couple of partridges upon his grounds, supposing that the rivalry of many males interrupted the breed. He used to say, that though he had widowed the same hen several times, yet he found she was still provided with a fresh paramour that did not take her away from her usual haunt."*

In opposition to this doctrine there is one instance, which has been celebrated from the earliest ages, the turtle-dove, being represented as the very emblem of conjugal love and fidelity. The dark or black-coloured turtle-dove, it is said, was employed by the Egyptians as the hieroglyphic of chaste widowhood, it being understood that, when one of a pair was killed, the other never joined with a second mate. "They be passing chaste," says Pliny, "and neither male nor female change their mate, but keep together one true unto the other. They abandon not their own nests, unless they be in a state of single life or widowhood by death of their fellow. The females are very meek and patient; they will endure and abide their imperious males, notwithstanding, otherwhiles, they be very churlish unto them, offering them wrong and hard measure, so jealous be they of the hens, and suspicious, though without any cause, for passing chaste and continent by nanure they are." The poets follow naturally in the same opinion, and hence from Ovid and Dante down to our own times, we meet with comparisons and allusions thence derived, as if the fact were ascertained beyond question.

* Nat. Hist. of Selbourne, letter 34.

The fact, however, of doves acting in this manner, so far from being correct, may be easily disproved by any one who will take the trouble, as well as by circumstances mentioned by the very writers just quoted. Aristotle, indeed, though he hints in one place his belief in the common opinion, mentions in another that he had known doves change their mates. The fact, moreover, that these birds are easily enticed from their own dovecots to others, and thus become lost to their owners, is but too well known to everybody who has ever kept them. "Some," says Pliny, "use means to keep pigeons in their dovehouse (for otherwise they be birds that love to be ranging and wandering abroad), namely, by slitting and cutting the joints of their wings with some thin sharp piece of gold; for if you do not so, their wounds will fester and be dangerous. And in very troth, these birds be soon seduced and trained away from their own homes; and they have a cast with them to flatter and entice one another: they take a great delight to inveigle others, and to steal away some pigeons from their own flocks, and evermore to come home better accompanied than they went forth." Now all this is evidently in direct contradiction to what we have quoted from the preceding page of the same work. M. Ray also informed Buffon, that notwithstanding the reputation of the turtle-dove for conjugal constancy, he found the females of those which were confined in voleries living almost promiscuously with the males. Nay, M. Ray asserts that he has observed the wild turtle-doves living in the same manner on the same tree. The common opinion, therefore, appears from these circumstances to be manifestly erroneous.

We meet, however, with instances among other birds of affectionate conjugality well worthy of being recorded; and we shall give one example of this kind, as described by Bingley, that occurred in a pair of the Guinea parrot (*Psittacus pullarius*).

"A male and female of this species were lodged together in a large square cage. The vessel which held their food was placed at the bottom. The male usually sat on the same perch with the female, and close beside her. Whenever one descended for food, the other always followed; and when their hunger was satisfied, they returned together to the highest perch of the cage. They passed four years together in this state of confinement; and from their mutual attentions and satisfaction, it was evident that a strong affection for each other had been excited. At the end of this period the female fell into a state of languor which had every symptom of old age; her legs swelled, and knots appeared upon them, as if the disease had been of the nature of gout. It was no longer possible for her to descend and take her food as formerly; but the male assiduously brought it her, carrying it in his bill and delivering it into hers. He continued to feed her in this manner with the utmost vigilance for four months. The infirmities of his mate, however, increased every day, and at length she became no longer able to sit upon the perch: she remained crouched at the bottom, and from time to time made a few useless efforts to regain the lower perch; while the male, who remained close by her, seconded these feeble attempts with all his power. Sometimes he seized with his bill the upper part of her wing, to try to draw her up to him: sometimes he took hold of her bill and attempted to raise her up, repeating his efforts for that purpose several times. His countenance, his gestures, his continual solicitude, everything, in short, indicated in this affectionate bird an ardent desire to aid the weakness of his companion, and to alleviate her sufferings. But the scene became still more interesting when the female was at the point of expiring. Her unfortunate partner went round and round her without ceasing; he redoubled his assiduities and his tender

cares; he attempted to open her bill, in order to give her nourishment; his emotion every instant increased; he went to her, and returned with the most agitated air and with the utmost inquietude; at intervals he uttered the most plaintive cries; at other times, with his eyes fixed upon her, he preserved a sorrowful silence. His faithful companion at length expired: he languished from that time, and survived her only a few months."*

CHAPTER XIII.

HATCHING AND SHELTERING OF THE YOUNG.

It is indispensable to hatching, that an equable temperature be kept up of about 96 degrees Fahr. or 32 degrees Réaum., for at lower temperatures the living principle appears to become torpid, and unable to assimilate the nourishment provided for developing the embryo. Proceeding upon this principle, the Egyptians, as well as those who have tried the experiment in Europe, have succeeded, by means of artificial heat, in hatching eggs without any aid from the mother birds.

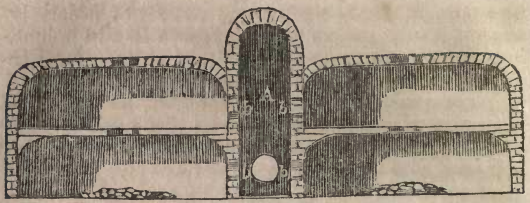
According to the best descriptions of the Egyptian *mamal*, or hatching oven, it is a brick structure about nine feet high. The middle is formed into a gallery about three feet wide and eight feet high, extending from one end of the building to the other. This gallery forms the entrance to the oven, and commands its whole extent, facilitating the various operations indispensable for keeping the eggs at the proper degree of warmth. On each side of this gallery there is a double row of rooms, every room

* Bingley, Anim. Biog., ii., 224.

on the ground-floor having one over it of precisely the same dimensions, namely, three feet in height, four or five in breadth, and twelve or fifteen in length. These have a round hole for an entrance of about a foot and a half in diameter, wide enough for a man to creep through, and into each are put four or five thousand eggs. The number of rooms in one mamal varies from three to twelve ; and the building is adapted, of course, for hatching from forty to eighty thousand eggs, which are not laid on the bare brick floor of the oven, but upon a mat or bed of flax, or other nonconducting material.

In each of the upper rooms is a fireplace for warming the lower room, the heat being communicated through a large hole in the centre. The fireplace is a sort of gutter, two inches deep and six wide, on the edge of the floor, sometimes all round, but for the most part only on two of its sides. As wood or charcoal would make too quick a fire, they burn the dung of cows or camels, mixed with straw, formed into cakes and dried. The doors which open into the gallery serve for chimneys to let out the smoke, which finally escapes through openings in the arch of the gallery itself. The fire in the gutters is only kept up, according to some, for an hour in the morning and an hour at night, which they call the dinner and supper of the chickens; while others say it is lighted four times a day. The difference probably depends on the temperature of the weather. When the smoke of the fires has subsided, the openings into the gallery from the several rooms are carefully stuffed with bundles of coarse tow, by which the heat is more effectually confined than it could be by a wooden door.

When the fires have been continued for an indefinite number of days, eight, ten, or twelve, according to the weather, they are discontinued, the heat acquired by the ovens being then sufficient to finish the hatching, which requires, in all, twenty-



Transverse section and elevation of an Egyptian Egg-oven.

one days, the same time as when eggs are naturally hatched by a hen. About the middle of this period, a number of the eggs in the lower are moved into the upper rooms, in order to give the embryos greater facility in making their exit from the shell than they would have if a number of eggs were piled up above them.

Transverse section and perspective elevation of an Egyptian Egg-oven.

The number of ovens dispersed in the several districts of Egypt has been estimated at 386; and this number can never be either increased or diminished without the circumstance being known, as it is indispensable for each mamal to be managed by a Bermean, none of whom are permitted to practise their art without a certified license from the Aga of Berme, who receives ten crowns for each

license. If, then, we take into account that six or eight broods are annually hatched in each oven, and that each brood consists of from 40,000 to 80,000, we may conclude that the gross number of chickens which are every year hatched in Egypt amounts to nearly 100,000,000. They lay their account with losing about a third of all the eggs put into the ovens. The Bermean, indeed, guaranties only two thirds of the eggs with which he is intrusted by the undertaker, so that out of 45,000 eggs he is obliged to return no more than 30,000 chickens. If he succeeds in hatching these, the overplus becomes his perquisite, which he adds to the sum of thirty or forty crowns, besides his board, that is paid him for his six months' work.

A few years ago an individual in the vicinity of London contrived an apparatus for hatching by means of steam, and exhibited it in the Egyptian Hall, Piccadilly; but we have not learned that he ever carried his invention so far as to make a trade of the chickens which he hatched.

The importance of keeping the eggs at a uniform temperature is beautifully illustrated by the care which hens may be observed to take in arranging the eggs they are hatching. Among other curious facts connected with this subject, is that of a hen throwing out or eating the eggs which she cannot conveniently cover.

We had brought to us three eggs of the wood-wren (*Sylvia sibilatrix*, Bechstein), and being anxious to have them hatched, we introduced them, after warming them slightly, into the nest of a canary, then sitting upon four eggs of her own. In the course of the day two of her own eggs had disappeared, having, we inferred, been destroyed by her because she could not cover the seven so as to keep them at a uniform temperature, the three small eggs being nearly equal in size to the two which were gone. It is no doubt for the same

reason that the birds in whose nest the cuckoo parasitically deposites her egg, often, if not always, turn out or destroy their own to make room for hers.

During the process of hatching, the mother-bird acts as if she knew that, by keeping the eggs all in one position, some would be more favourably treated than others.

Sheltering of the Young.—In rearing tender songbirds taken from their mothers, as is frequently done, before they are fledged, experience proves that warmth is no less indispensable than food; exposure to cold during the night frequently killing the most healthy nestlings. The mother-birds, well aware of this, are equally assiduous in covering their chicks after they are hatched as they had previously been while sitting on the eggs. Among small birds (*Sylvicolæ*, Vieillot), accordingly, for several days after her brood has been hatched, the mother seldom quits the nest, the male providing the food necessary for her and the little ones, who as yet require but a very small portion. The wren, and other birds which build domed nests, have this additional protection to prevent the dissipation of their animal heat; and birds of prey, pigeons, and crows, have but a small number of nestlings to shelter.

In the case again of poultry, when the newly-hatched birds can run about, the mothers have no little trouble in sheltering them from the cold, and, even during the hottest weather, from rain, which proves very injurious in consequence of the cold produced by its evaporation. However much, also, we may admire the ingenuity of birds in some things, and their anxious affection for their young, yet they exhibit in other instances great apparent stupidity; and maternal affection, so far from sharpening their faculties, seems at first rather to blind them, and to cause them to injure and even to kill some of their chickens through awkwardness or in-

consideration. A hen, for example, out of over-anxiety to have her chickens near her, will not unfrequently set her foot upon some of them so as to crush or mortally injure them; and the same accident often happens by her sitting over them with her body to keep them warm. Again, in scratching to procure them food, she seems quite heedless where she strikes with her foot; and we have observed in several instances that she kicked the chickens behind her, and laid them sprawling on the ground. But, independently of such accidents as these, no hen, whatever may be her care, can prevent her brood from often passing through sudden changes of temperature. She neither can nor ought to sit on them constantly, as they must eat and run about; and in cold or rainy weather, the damp ground must prove very injurious, even when she has them under her warm wings. Hence it is that we frequently see a mother not able to rear above three or four out of a dozen or more that she may have hatched.

It has been recorded that the male has sometimes performed all these duties of the mother, when she has been accidentally killed or has abandoned her brood. Aristotle tells us that he witnessed an instance of this kind;* and Pliny says, "We have heard that when a brood hen chanced to die, the cocks were seen to go about with the chickens one after another by turns, and to do everything like to the very hen that hatched them, and all that while to forbear once to crow."† Albertus Magnus witnessed a similar case; and Ælian even mentions a cock which, on the death of the hen while hatching, sat on the eggs and brought up the chicks.‡ Willoughby says, "We have beheld more than once, not without pleasure and admiration, a capon bring-

* Hist. Anim., ix., 49. † Holland's Transl., i., 299.
‡ Hist., iv., 29. Apud Aldrovandi, ii., 107.

ing up a brood of chickens like a hen, clucking of them, feeding them, and brooding them under his wings, with as much care and tenderness as their dams are wont to do."* This leads us to the very curious subject of training capons to perform the office of a mother, which was practised as early as the sixteenth century.

In order to train a capon for this purpose, we are instructed by Baptista Porta, in his curious book on Natural Magic, to make him so tame that he will take food out of the hand, then about eventide to pluck the feathers off his breast, to irritate the bare skin by rubbing it with nettles, and then to put the chickens to him. They will naturally huddle under him, and, by rubbing with their heads, allay the itching caused by the nettles; and, upon repeating this for two or three nights, he will gradually take an affection for the chickens, and attend to them like a mother. The author thinks it may probably be on the principle of mutual distress producing mutual sympathy, that the querulous chirp of the chickens may make him, while in pain himself, desirous of allaying their misery. A capon once accustomed to this office, will not abandon it, but, when one brood is grown up, another of newly-hatched chickens may be put to him, and he will be as kind to them, and take as much care of them, as of the first, and so in succession.

The feeling of tenderness for the young broods of other birds, in whatever way it may be supposed to originate, has been exemplified in several very striking instances, both among birds and other animals. "In the month of May," says M. de Buffon, "a young henbird was brought to me which was not able to feed without assistance. I caused her to be educated; and she was hardly fledged when I received from another place a nest of three or

* Ray's Willoughby, p. 156.

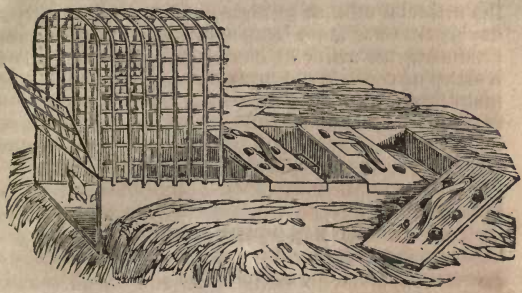
four unfledged skylarks. She took a strong liking to these new-comers, which were scarcely younger than herself; she attended them night and day, cherished them beneath her wings, and fed them with her bill. Nothing could interrupt her tender offices. If the young ones were torn from her, she flew to them as soon as she was liberated, and would not think of effecting her own escape, which she might have done a hundred times. Her affection grew upon her; she neglected food and drink; she now required the same support as her adopted offspring; and expired at last, consumed with maternal anxiety. None of the young ones survived her. They died one after another; so essential were her cares, which were equally tender and judicious."

But in the case of artificial hatching by means of ovens, it must frequently be found impossible to procure a sufficient number of nurses either of hens or capons; and in that case, in order to rear the chickens successfully, artificial methods must be continued. Were all the assiduities indeed of the hen required, it would be next to impossible to find an artificial substitute; but as her chief object is to procure food and secure warmth, these, with a little attention, may be supplied as well, or even better, by art than by the most assiduous mother. Réaumur, in the course of his interesting experiments, tried several plans for the substitution of what he aptly denominates an artificial mother.

"My apparatus," he says, "did not at first seem sufficiently perfect; for, though the chickens were kept in warm air, they had no equivalent for the gentle pressure of the belly of the mother upon their backs when she sits over them. Their back is, in fact, necessarily more warmed than the other parts of the body while huddling under their mother's wings; whereas their belly often rests on the cold, moist earth, the reverse of what took place in

the apparatus, where their feet were the best warmed. The chickens themselves indicated that they were more in want of having their backs warmed than any other part of their body; for, after all of them had repaired to the warmest end of the apparatus, instead of squatting as they naturally do when they rest, they remained motionless, standing bolt upright upon their legs, with their backs turned towards the sides or end of the apartment in order to procure the necessary warmth. I therefore judged that they wanted an apparatus that might, by resting on them, determine them to take the same attitude as they naturally assume under the hens, and I contrived an inanimate mother that might supply, in this respect, the want of a living one."

The artificial mother contrived upon these principles, consists of a box lined with sheepskin, with the wool on it, the bottom being of a square form, and the upper part sloped like a writing-desk. This box is placed at the end of a crib or cage, shut with a grating of willow, net, or wire, and closed above with a hinged lid, the whole being so formed that the chickens can walk round the sides. The slope of the cover permits the chickens to arrange themselves according to their sizes; but as it is their practice, as well as that of all other young birds, to press very closely together, and even to climb upon one another, the small and the weak being thereby in danger of being crushed or smothered, Réaumur constructed his artificial mother open at both ends, or, at most, with only a loose netting hanging over it. Through this the weakest chicken can escape when it feels itself too much squeezed, and then, by going round to the other opening, it may find a less dangerous neighbourhood. The ingenious author even made improvements upon this contrivance, one of which consisted in keeping the cover sloped so as to prevent the chickens from climbing on each other, and raising it as they increased in



Improved Artificial Mother.

growth. Another was the dividing the large cribs into two by means of a transverse partition, so as to separate the chickens of different sizes.

"They soon showed me," says Réaumur, "how sensible they were of the advantage of my artificial mother, by their delight in remaining under it and pressing it very close. When they had taken their little meals they jumped and capered about, and when they began to be tired they repaired to this mother, going so deep into it that they were compelled to squat, so that, when the roof was turned up, I perceived the impression of the backs of several chickens upon the fur lining. There is, indeed, no natural mother that can be so good for the chickens as the artificial one, and they are not long in discovering this, instinct being a quick and sure director. Chickens, direct from the hatching oven, from twelve to twenty-four hours after their escape from the shell, will begin to pick up and swallow small grains or crumbs of bread; and, after having eaten and walked about a little, they soon find their way to the fleecy lodge, where they can rest and warm themselves, remaining till hunger puts them

again in motion. They all betake themselves to the artificial mother at night, and leave it exactly at daybreak, or when a lamp is brought into the place, producing an artificial daybreak, with which, it is worthy of remark, old hens are not affected, but remain immovable on their roosts.

CHAPTER XIII.

FEEDING AND TRAINING OF THE YOUNG.

Birds differ essentially from quadrupeds in their mode of providing food for their young. Among the latter, Providence has furnished the mother with a supply of food for her offspring within herself till the teeth arrive at sufficient growth for manducation; and hence even animals of prey do not, for several weeks, bring food to their cubs, but nourish them solely with milk. Birds, on the other hand, have to provide food for their young from the second day after they are hatched. During the first day they have, in general, sufficient nutriment in the last portions of the yolk of the egg, which they have absorbed through the umbilical vessels.

So anxious are the parent birds to provide food for their young, that several of them exhibit, during the breeding season, more omnivorous propensities than at any other. We may indeed occasionally see a chaffinch (*Fringilla spiza*) or a green-bird (*F. chloris*) catch a fly or a beetle, but never, we believe, except when seeds are scarce. On the contrary, in feeding their young, insects constitute probably their sole provision, the seeds upon which the old birds live being too indigestible at least for the unfledged young. In the same way some of the

larger birds, which are at all times omnivorous, such as the magpie (*Pica caudata*, Ray), exhibit more carnivorous propensities than usual. Speaking of the magpie, Mr. Knapp says, "When a hatch is effected, the number of young demand a larger quantity of food than is easily obtained, and whole broods of our ducklings, whenever they stray from the yard, are conveyed to the nest."*

The same delightful writer gives an account of the rearing of a brood of tomtits, which shows that smaller birds are no less provident with regard to the quantity of food furnished to their young than the eagle or the magpie. "I was lately," says he, "exceedingly pleased in witnessing the maternal care and intelligence of this bird; for the poor thing had its young ones in the hole of a wall, and the nest had been nearly all drawn out of the crevice by the paw of a cat, and part of its brood devoured. In revisiting its family, the bird discovered a portion of it remaining, though wrapped up and hidden in the tangled moss and feathers of their bed, and it then drew the whole of the nest back into the place from whence it had been taken, unrolled and resettled the remaining little ones, fed them with the usual attentions, and finally succeeded in rearing them. The parents of even this reduced family laboured with great perseverance to supply its wants, one or the other of them bringing a grub, caterpillar, or some insect, at intervals of less than a minute, through the day, and probably in the earlier part of the morning more frequently; but if we allow that they brought food on the whole every minute for fourteen hours, and provided for their own wants also, it will admit of perhaps a thousand grubs a day for the requirements of one, and that a diminished brood; and give us some comprehension of the infinite number requisite for the

* Journal of a Naturalist, p. 133, third edition.

dens. A gentleman who was at the trouble of watching these birds, observed that the parents generally went from the nest and returned with insects from forty to sixty times in an hour, and that in one particular hour they carried food no fewer than seventy-one times. In this business they were engaged during the greatest part of the day. Allowing twelve hours to be thus occupied, a single pair of these birds would destroy at least 600 insects in the course of one day, on the supposition that the two birds took only a single insect each time. But it is highly probable that they often took more."*

Looking at the matter in this point of view, the destruction of insectivorous birds has, in some cases, been considered as productive of serious mischief.

From its sometimes eating grain and other seeds, "the rook," says Selby, "has erroneously been viewed in the light of an enemy by most husbandmen; and in several districts attempts have been made either to banish it or to extirpate the breed. But wherever this measure has been carried into effect, the most serious injury to the corn and other crops has invariably followed, from the unchecked devastations of the grub and caterpillar. As experience is the sure test of utility, a change of conduct has in consequence been partially adopted; and some farmers now find the encouragement of the breed of rooks to be greatly to their interest, in freeing their lands from the grub of the cockchafer (*Melolontha vulgaris*), an insect very abundant in many of the southern counties. In Northumberland I have witnessed its usefulness in feeding on the larvæ of the insect commonly known by the name of Harry Longlegs (*Tipula oleracea*),

* Anim. Biogr., ii., 282, 6th edit.

which is particularly destructive to the roots of grain and young clovers."*

It has on similar grounds been contended, that the great number of birds caught by bird-catchers, particularly in the vicinity of London, has been productive of much injury to gardens and orchards.

In the case of swallows, it has been well remarked by an excellent naturalist, that they are to us quite inoffensive, while "the beneficial services they perform for us, by clearing the air of innumerable insects, ought to render them sacred and secure them from our molestation. Without their friendly aid, the atmosphere we live in would scarcely be habitable by man: they feed entirely on insects, which, if not kept under by their means, would swarm and torment us like another Egyptian plague. The immense quantity of flies destroyed in a short space of time by one individual bird is scarcely to be credited by those who have not had actual experience of the fact." He goes on to illustrate this from a swift (*Cypselus murarius*, Temminck) which was shot. "It was in the breeding season when the young were hatched; at which time the parent birds, it is well known, are in the habit of making little excursions into the country to a considerable distance from their breeding-places, for the purpose of collecting flies, which they bring home to their infant progeny. On picking up my hapless and ill-gotten prey, I observed a number of flies, some mutilated, others scarcely injured, crawling out of the bird's mouth; the throat and pouch seemed absolutely stuffed with them, and an incredible number was at length disgorged. I am sure I speak within compass when I state that there was a mass of flies, just caught by this single swift, larger than, when pressed close,

* Illustrations, p. 73.

could conveniently be contained in the bowl of an ordinary tablespoon."*

The extraordinary affection exhibited by the parent birds for their young is strikingly exemplified in the instances recorded of their risking their own freedom and safety by venturing into houses whither their nestlings have been carried. We once witnessed an instance of this in a pair of goldfinches, who were, however, enticed by hanging the cage containing the nestlings upon their native tree in an orchard, from which it was gradually removed to the outside of a window, and afterward taken indoors, whither the parent goldfinches followed, and assiduously supplied their young with food. No attempt was made to catch the old ones; yet with all their anxiety to supply the young with food, they took care, although the window was left open for them, never to remain in the room during the night, roosting always in an adjacent tree in the orchard. An interesting story of a similar kind is told by Colonel Montagu respecting the gold-crested wren (*Regulus cristatus*, Ray).

"A pair," says he, "of these birds, who took possession of a fir-tree in my garden, ceased their notes as soon as the young were hatched; and as this beautiful little family caused me much delight and amusement, some observations thereon may not be unacceptable to the curious reader. When first I discovered the nest I thought it a favourable opportunity to become acquainted with some of the manners of this minute species, and to endeavour to discover whether the male ever sung by way of instructing the young ones. Accordingly, I took the nest, when the young were about six days old, placed it in a small basket, and by degrees enticed the old ones to my study-window; and after they became familiar with that situation, the basket was

* Rev. W. T. Bree, Mag. Nat. Hist., iii., 37.

placed within the window, then at the opposite side of the room. It is remarkable that although the female seemed regardless of danger, from her affection to her young, the male never once ventured within the room, and yet would constantly feed them while they remained at the outside of the window; on the contrary, the female would feed them at the table at which I sat, and even when I held the nest in my hand, provided I remained motionless. But on moving my head one day, while she was on the edge of the nest, which I held in my hand, she made a precipitate retreat, mistook the open part of the window, knocked herself against the glass, and laid [lay] breathless on the floor for some time. It is probable the focal distance of such minute animals' eyes is very near, and that large objects are not represented perfect on the *retina;* that they do not seem to see such distinctly is certain, unless in motion. However, recovering a little, she made her escape, and in about an hour after I was agreeably surprised by her return; and she would afterward frequently feed the young while I held the nest in my hand. The male bird constantly attended the female in her flight to and fro, but never ventured beyond the window-frame, nor did he latterly ever appear with food in his bill. He never uttered any note but when the female was out of sight, and then only a small chirp. At first there were ten young in the nest; but probably, for want of the male's assistance in procuring food, two died. The visits of the female were generally repeated in the space of a minute and a half or two minutes, or, upon an average, thirty-six times in an hour; and this continued full sixteen hours in a day, which, if equally divided between the eight young ones, each would receive seventy-two feeds in the day; the whole amounting to five hundred and seventy-six. From examination of the food, which by accident now and then dropped into the

nest, I judged from those weighed that each feed was a quarter of a grain upon an average; so that each young one was supplied with eighteen grains weight in a day; and as the young ones weighed about seventy-seven grains at the time they began to perch, they consumed nearly their weight of food in four days' time at that time. This extraordinary consumption seems absolutely requisite in animals of such rapid growth. The old birds of this species weigh from eighty to ninety grains. I could always perceive, by the animation of the young brood, when the old one was coming; probably some low note indicated her approach, and in an instant every mouth was open to receive the insect morsel. But there appeared no regularity in the supply given by the parent bird; sometimes the same was fed two or three times successively, and I generally observed that the strongest got most, being able to reach farthest, the old one delivering it to the mouth nearest to her."

It would be easy for us to extend this chapter to a much greater length by similar anecdotes, but we shall only add one more respecting one of the humming-birds (*Trochilidæ*), mentioned by M. Labat, premising that we have no means of ascertaining the particular species meant. It being found extremely difficult, if not impossible, to breed the young humming-birds, endeavours have been made to rear them by taking advantage of the natural affection of the parents for their offspring. Our author records an instance of such an experiment: "I showed," says he, "a nest of humming-birds to Father Montdidier, which was placed on a shed near the house. He carried it off with the young, when they were about fifteen or twenty days old, and put them in a cage at his room window, where the cock and hen continued to feed them, and grew so tame that they scarcely ever left the room; and though not shut in the cage, nor subjected to any

restraint, they used to eat and sleep with their brood. I have often seen all the four sitting upon Father Montdidier's finger, singing as if they had been perched upon a branch. He fed them with a very fine and almost limpid paste, made with biscuit, Spanish wine, and sugar. They dipped their tongue in it, and when their appetite was satisfied they fluttered and chanted. I never saw anything more lovely than these four pretty little birds, which flew about the house and attended the call of their foster-father. He preserved them in this way five or six months, and we hoped soon to see them breed, when Father Montdidier, having forgotten one night to tie the cage in which they were roosted by a cord that hung from the ceiling, to keep them from the rats, had the vexation in the morning to find that they had disappeared; they had been devoured."

Training of Young Birds by their Parents.—By far the greater number of the actions of animals appear to be performed without previous instruction, in a manner which, being inexplicable in the present state of knowledge, is designated by the terms *instinct* and *instinctive*, meaning that the motives to any particular movement or action, as well as the mode of execution, originate in the animal spontaneously, without the series of reasoning, or thinking and determining, which we employ in similar cases. Thus a frog is said to swim *instinctively* in water; that is, it requires no training, no instruction in the art of swimming, no more than we do in the process of breathing; and the same may be said with regard to the swimming of most other animals, even those least accustomed to water, few being unable to swim except man, who requires training and instruction for that purpose. It is not our design to enter here upon the difficult subject of *instinct* farther than to point out a few of the acquired actions of birds, originating either in

the express instruction or imitation of their parents.

With respect to the eagle, which is the most celebrated from the remotest antiquity for instructing its young, we are told by Moses that she "stirreth up her nest, fluttereth over her young, spreadeth abroad her wings, and taketh them and beareth them on her wings."* Aristotle adds, that the young are not permitted to leave the nest prematurely; and if they make the attempt, their parents beat them with their wings and tear them with their claws. Be this as it may, we are assured that eagles will feed their young for a considerable period, if the latter are disabled from flying by clipping their wings; and it is recorded that a countryman once obtained a comfortable subsistence for his family out of an eagle's nest, by clipping the wings of the eaglets and tying them so as to increase their cries, a plan which was found to stimulate the exertions of the old birds in bringing prey to the nest. It was, of course, necessary for him to make his visits when the old birds were absent, otherwise he might have been made to pay dearly for his plunder. After instructing their young in flying and hunting, the parent eagles, like other birds of prey, drive them from their territory, though not, we believe, as Aristotle says, from the nest. Bonnet says, "The eagle instructs its young in flying, but does not, like the stork, prolong their education, for it mercilessly drives them away before they are thoroughly taught, and forces them to provide for their own wants. All the tyrants of the air act in the same manner; yet though this seems cruel and shocking when we consider their close relationship, it takes a different aspect when we consider the kind of life led by those voracious birds. Destined to subsist by rapine and carnage, they would soon produce a famine among their

* Deuteronomy, xxxii., 11.

race did many of them dwell in the same district. For which reason they hasten to drive away their young at a certain age from their boundaries, and then, if a scarcity of provision occur, the male and female put one another to death.

Another bird celebrated for instructing its young is the stork. When the wings of the young storks begin to grow, they are said to try their strength in fluttering about the nest; though it often happens that, in this exercise, some of them fall and are unable to regain their place. When they first venture to commit themselves to the air, the mother leads them in small circumvolutions about the nest, whither she conducts them back, and about the end of August, the young ones having acquired strength, unite with the old ones for the purpose of migration. "When the young storks," says Bonnet, as if speaking from observation, "begin to try their wings, the mother fails not to watch over and conduct them. She exercises them by little and little in short flights around the nest, to which she soon conducts them again. She continues her attention for a long time, and does not abandon them till their education is completed."

We are disposed, however, to look upon much that has been written respecting parent birds instructing their young as merely fanciful; and whether we are right in this may be readily verified by observing and comparing facts of daily occurrence. In the case of a brood of ducklings, for example, it might be plausibly alleged that their parents taught them to swim, because the mother may be seen swimming before them as their leader, and the little things all paddling after her, according to their strength or their agility. But, in order to prove this view to be correct, it would be indispensable to show that the ducklings could not swim till they were instructed by their mother, which clearly appears not to be the case; for a duckling, as

soon as it acquires the requisite strength of foot, which occurs a very short time after it is hatched, takes to the water and swims as dexterously as its mother herself can do. Nay, it cannot only swim so as merely to keep itself afloat, but it knows, without any instruction, how to proportion the frequency and force of the strokes of either foot so as to carry it to any part of the pond it chooses, as accurately as if it were profoundly acquainted with the mathematical problems of the composition and resolution of forces. No instruction nor imitation of the parent will account for this, inasmuch as ducklings hatched in an oven will take to the water as readily as those tended by a female duck; and, in the common occurrence of their being hatched under a hen, they will swim away and leave their foster-mother on the bank of the pond in utter despair for their safety. This proves not only that they can swim without instruction, but in opposition to the most earnest solicitude of their sole instructress. We have witnessed a similar case, no less in point, in a brood of turkeys hatched by a goose, which their foster-mother, as was natural, was desirous of leading into the water, but this they refused as obstinately as ducklings do to quit the water when recalled by a hen.

We think it highly probable that the instances of the eagle and the stork above quoted, admit of a similar solution into instinctive motives independent of instruction. Even the case of the hen, who leads her chickens so assiduously to where they may find food, though it appears to be more like instruction than the instances of the eagle and the stork, is far from being conclusive; for chickens which are hatched artificially seem to be at no loss in learning to feed, though they have no mother; and ducks hatched under a hen will take the water in spite of her most anxious warnings.

The swallows and sparrows, which, from building

in our houses, are more under common observation than most wild birds, may readily be fancied to be seen instructing their young to fly. The whole family may have got out of the nest and have perched on the tiles, on a window-ledge, or on the projecting bricks of a neighbouring chimney, basking themselves in the sunshine, and enjoying the freshness of the summer air; and the parents, in their exuberance of joy at having reared their young ones so far without accident, may be seen flitting about from one to another, and sometimes making short excursions to the nearest tree, as if to survey their young from a different point of view, chuckling all the while with buoyant delight, in tones which many observers would not hesitate to interpret as invitations to the little things to try their wings. We are more inclined, however, to consider the conduct of the parent birds on such occasions as simply expressive of pleasurable feeling; and if an anxious movement or the tremulous tone of fear be heard to intermingle, it may usually, we think, be traced to the attempts made by the young birds to fly, the old ones naturally anticipating the possibility of danger, from the known weakness of wing, as well as the inexperience of the young ones, placed, as they usually are in such cases, at a considerable height.

In the instance of impending danger or on the approach of an enemy, the parent birds eagerly express their feelings of solicitude, though it is questionable, we think, whether the cries they utter are meant or understood by the young as invitations to fly to a place of greater security. We have in this way observed, in the case of a brood of young goldfinches (*Carduēlis elegans*, STEPHENS), perched on an apple-tree and chirruping in chorus, that, when the watchful parents warned them of our approach, they did not fly towards them for protection, but instantly ceased to chirrup, squatting close to the

branches where they were sitting. Yet we can imagine, and have seen, cases in which young birds, being in confinement or in danger, have been solicited to shift their quarters with all the varied tones and movements of invitation, which are, in fact, identical with the tones used in feeding, and, to all appearance, instinctively understood. It is thus we would explain the following interesting narrative, which proves that, had the author had opportunities for observation, he might have accomplished something much superior to his very imperfect though well-planned compilation.

"When I was a boy," says Smellie, "I carried off a nest of young sparrows, about a mile from my place of residence. After the nest was completely removed, and while I was marching home with them in triumph, I perceived, with some degree of astonishment, both the parents following me at some distance, and observing my motions in perfect silence. A thought then struck me that they might follow me home, and feed the young according to their usual manner. When just entering the door, I held up the nest, and made the young ones utter the cry expressive of the desire of food. I immediately put the nest and the young in the corner of a wire cage, and placed it on the outside of a window. I chose a situation in the room where I could perceive all that should happen without being myself seen. The young animals soon cried for food. In a short time both parents, having their bills filled with small caterpillars, came to the cage; and after chatting a little, as we do with a friend through the lattice of a prison, gave a small worm to each. This parental intercourse continued regularly for some time, till the young ones were completely fledged, and had acquired a considerable degree of strength. I then took one of the strongest of them and placed him on the outside of the cage, in order to observe the conduct of the parents after one of

their offspring was emancipated. In a few minutes both parents arrived, loaded, as usual, with food. They no sooner perceived that one of their children had escaped from prison, than they fluttered about and made a thousand demonstrations of joy, both with their wings and with their voices. These tumultuous expressions of unexpected happiness at last gave place to a more calm and soothing conversation. By their voices and their movements it was evident that they earnestly entreated him to follow them, and to fly from his present dangerous state. He seemed to be impatient to obey their mandates; but, by his gestures and the feeble sounds he uttered, he plainly expressed that he was afraid to try an exertion he had never before attempted. They, however, incessantly repeated their solicitations; by flying alternately from the cage to a neighbouring chimney-top, they endeavoured to show him how easily the journey was to be accomplished. He at last committed himself to the air, and alighted in safety. On his arrival, another scene of clamorous and active joy was exhibited. Next day I repeated the same experiment, by exposing another of the young ones on the top of the cage. I observed the same conduct with the remainder of the brood, which consisted of four. I need hardly add, that not one, either of the parents or children, ever afterward revisited the execrated cage."*

It does not appear to us that, in the instance of carnivorous birds, the bringing of live prey to the young, and of inviting them to kill and devour it, is capable of being interpreted, as it usually has been, as an instance of training them to hunt. We have seen a kitten brought up by hand from the day it could see, and, of course, before the mother had any opportunity of instructing it to mouse, exhibit

* Philosophy of Natural History.

all the cunning devices of a practised veteran in lying in wait for a mouse, which it succeeded in capturing, though, so far as we were aware, it had never before seen a mouse; and we have not a doubt, though we never witnessed an instance, that a young hawk would pounce upon the first live bird presented to it, independently of all experience and instruction.

CHAPTER XIV.

LANGUAGE OF BIRDS.

By the term *language*, in reference to birds, we mean sounds which can be mutually understood, excluding the words and phrases which parrots and starlings may be taught by imitation, but to which the birds that repeat them can attach no meaning. An example will best illustrate this, and we do not recollect one more apposite than a circumstance mentioned by Wilson when speaking of the richel bird (*Sterna minuta*). "I lately," he says, "visited those parts of the beach on Cape May where this little bird breeds. During my whole stay, these birds flew in crowds around me, and often within a few yards of my head, squeaking like so many young pigs, which noise their voice strikingly resembles. A humming-bird, that had accidentally strayed to the place, appeared suddenly among this outrageous troop, several of whom darted angrily at him; but he shot like an arrow from them, directing his flight straight towards the ocean. I have no doubt but the distressing cries of the terus had drawn this little creature to the scene, having frequently witnessed his anxious curiosity on simi-

lar occasions in the woods."* The humming-bird, indeed, is not alone in the exhibition of curiosity to see what is going forward when other birds are vociferous. We recollect having our attention once drawn to the loud scolding of a pair of chaffinches in a copse, a circumstance of very frequent occurrence during summer, but rendered peculiar in the instance in question by the birds darting down almost to the roots of the bushes at some distance from where we stood, from which we concluded their scolding was not directed to us. The loud *pink, pink*, of the chaffinches soon attracted to the spot a crowd of their woodland neighbours, among whom a redbreast took the lead, followed by a greenbird, a songthrush, and about a dozen of the small summer birds (*Sylviadæ*), all brought together by curiosity to learn what the chaffinches were scolding about. From all of these curiosity-hunters giving vent to the same expression of feeling, we concluded that some common enemy had made his appearance among them; and upon looking narrowly into the bushes we perceived a pine martin (*Martes abietum*, Ray) stealing along, occasionally throwing a sly, or, rather, contemptuous look at his vociferous railers, but otherwise continuing a careful prying search into every hole and bush for a nest of eggs or young, of which he might make a breakfast.

It appears, however, to be a shrewd and correct observation of Mr. Knapp, that the voice of one species of birds, except in particular cases, is not attended to by another species; and he instances the peculiar call of the female cuckoo, which resembles so many contending rivals, but excites no attention generally, inasmuch as the dialect seems to be unknown to all but its own species. He adds, "I know but one note which animals make use of

* Wilson, Am. Ornith., vii., 85.

that seems of universal comprehension, and this is the signal of danger: the instant it is uttered, we hear the whole flock, though composed of various species, repeat a separate moan, and away they all scuttle into the bushes for safety."*

The latter circumstance, however, is contrary to all that we have ever observed; for, instead of flying or hiding from danger, the alarm-call seems to imbolden even the most timid to run every hazard; and, accordingly, it is matter of common observation, that whenever a hawk makes his appearance, the first swallow which descries him sounds the tocsin, when not only all the swallows in the vicinity muster their forces, but many other small birds hurry to the spot, and, so far from skulking away out of danger, they boldly face their powerful foe, attacking him fearlessly with beak and wing, till some individual pays the penalty of his temerity. With this exception we can bear testimony to the description of Mr. Knapp being minutely correct. "Some," he adds, "give the maternal hush to their young, and mount to inquire into the jeopardy announced. The wren, that tells of perils from the hedge, soon collects about her all the various inquisitive species within hearing to survey and ascertain the object and add their separate fears. The swallow, that, shrieking, darts in devious flight through the air when a hawk appears, not only calls up all the hirundines of the village, but is instantly understood by every finch and sparrow, and its warning attended to."†

Dr. Darwin, in his usual ingenious but fanciful manner, endeavours to show that this language of fear and alarm is (like other sounds usually considered natural) acquired and conventional like human speech. His facts will amuse the reader, while his inferences must appear quite hypothetical and

* Journal of a Naturalist p. 268, third edit. † Ibid.

strained. "All other animals," he says, "as well as man, are possessed of the natural language of the passions, expressed in signs or tones; and we shall endeavour to evince that those animals which have preserved themselves from being enslaved by mankind, and are associated in flocks, are also possessed of some artificial language and of some traditional knowledge.

"The mother-turkey, when she eyes a kite hovering high in air, has either seen her own parents thrown into fear at his presence, or has by observation been acquainted with his dangerous designs upon her young. She becomes agitated with fear, and uses the natural language of that passion; her young ones catch the fear by imitation, and in an instant conceal themselves in the grass.

"At the same time that she shows her fears by her gesture and deportment, she uses a certain exclamation, Koe-ut, Koe-ut, and the young ones afterward know that the presence of their adversary is denounced, and hide themselves as before.

"The wild tribes of birds have very frequent opportunities of knowing their enemies by observing the destruction they make among their progeny, of which every year but a small part escapes to maturity; but to our domestic birds these opportunities so rarely occur, that their knowledge of their distant enemies must frequently be delivered by tradition in the manner above explained, through many generations.

"This note of danger, as well as the other notes of the mother-turkey, when she calls her flock to their food or to sleep under her wings, appears to be an artificial language, both as expressed by the mother and as understood by the progeny. For a hen teaches this language with equal ease to the ducklings she has hatched from supposititious eggs, and educates as her own offspring; and the wagtails or hedge-sparrows learn it from the young

cuckoo, their foster nursling, and supply him with food long after he can fly about, whenever they hear his cuckooing, which Linnæus tells us is his call of hunger.* And all our domestic animals are readily taught to come to us for food when we use one tone of voice, and to fly from our anger when we use another."

Those who have attended minutely to the language of fear, alarm, or defiance among birds, cannot fail to have remarked the considerable variety both of notes and intonation in the same species. Thus, as White of Selborne remarks, "when the hen turkey leads forth her young brood, she keeps a watchful eye, and if a bird of prey appear, though ever so high in the air, the careful mother announces the enemy with a little inward moan, and watches him with a steady and attentive look; but, if he approach, her note becomes earnest and alarming, and her outcries are redoubled."† In the instance of a male bird expressing fear or giving an alarm to the hen of the approach of danger near the nest, the tones seem to be varied so as to give her due notice either to keep close and still, or to make her escape with as much caution as she can. "This note," observes Mr. Syme, "is only comprehended by birds of the same species, though we have certainly seen birds of different genera appear as if alarmed by this note of fear sounded by a bird of a different species or genus; but whether it was the note that alarmed them or our presence, we cannot say. But we are pretty sure the notes of parent birds and the chirp of their young are only understood by birds of the same species, or, rather, we should say, same family, for it appears to be a family language, understood reciprocally by parent birds and their young: for the young know the notes of the parents, and the parents those of their own

* Syst. Nat. † Letter 85.

brood, among all the young broods of other birds of the same species in the neighbourhood; and this they do as distinctly as the ewe knows the bleat of her own lamb, or the lamb the cry of its own mother, among a large flock. With regard to the note of alarm birds send forth on the approach of their natural enemies, whether a hawk, an owl, or a cat, we consider it to be a general language perfectly understood by all small birds, though each species has a note peculiar to itself. This note differs in sound from the note of fear or alarm given by them when man approaches near their nests. This last seems confined to particular species; but this general alarm note (which is understood by all small birds), we should call their war-whoop or gathering cry, for it is a true natural slogan."*

The noisy cackle of jays, the cawing of rooks, and the incessant yelp of sparrows, appear, so far as we can judge, to be partly so many social signals for congregating in a particular place, and to be continued after the flock has assembled, either to warn stragglers to what point they ought to wing their way, or, in the spirit of rivalry which prevails so extensively among birds, with the object of outvying each other in loudness of tone. It is remarkable, indeed, that most, if not all gregarious birds are thus noisy, and differ much in this respect from solitary or sub-solitary birds. If a rook or a seagull, therefore, is by accident separated from its companions, it will keep up an incessant vociferous call, till a response is returned either from some other straggler or from the colony to which it belongs. The necessity of such a habit as this is still more obvious in the case of those birds which migrate together at night. "Aquatic and gregarious birds," says White, "especially the nocturnal, that shift their quarters in the dark, are very noisy and

* Brit. Song Birds, Intr., p. 31.

loquacious; as cranes, wild geese, wild ducks, and the like; their perpetual clamour prevents them from dispersing and losing their companions;" and accordingly, when residing near the sea or a large river, we have often heard the scream of these night-fliers "startle the dull ear of night."

There appears, however, to be a decided and well-understood distinction between the call of such stragglers as we have just alluded to, and the gathering-cry when an individual has discovered abundance of food. A seamew, or, what is more common, a pair of seamews, may thus be seen far inland, whither they have probably been driven by blowing weather, coursing about high in the air, sometimes flying in one direction, and sometimes tacking about, and all the while uttering at intervals a peculiar callnote; but, even should this occur near the beach, no other seamew would think of coming at the signal. But, on the other hand, the note of intimation proceeding from an individual who has discovered a good fishing-station over a sandbank, is so well understood and so quickly obeyed, that we have repeatedly seen some hundreds of birds hurry to the place in a few minutes, though none were previously observable.

There are instances, however, of birds thus calling when on the wing, which it does not seem so natural to account for on either of these suppositions. We may mention the shrill, harsh scream of the kingfisher and of the dipper (*Cinclus aquaticus*, Bechstein), which, so far as our observation goes, is repeated every time these birds take wing. It may, perhaps, as they are almost always seen in pairs, be meant as a signal-note to the mate, an explanation rendered more probable by the rapidity of their flight, which carries them in an instant to a great distance along the stream, so that without some such watchcall they might soon be separated. This call is not unlike the sound of a stick drawn rapidly

across the uprights of an iron railing, and comes on the ear so quick and transient that it is impossible to catch a view of the bird by trying to follow the sound.

It is ingeniously, and, as we think, correctly remarked by Mr. Knapp, that, "as Nature in all her ordinations had a fixed design and foreknowledge, it may be that each species had a separate voice assigned it, that each might continue as created, distinct and unmixed; and the very few deviations and admixtures that have taken place, considering the lapse of time, association, and opportunity, united with the prohibition of continuing accidental deviations, are very remarkable, and indicate a cause and original motive. That some of the notes of birds are a language designed to convey a meaning, is obvious from the very different sounds uttered by these creatures at particular periods; the spring voices become changed as summer advances, and the requirements of the early season have ceased: the summer excitements, monitions, informations, are not needed in autumn, and the notes conveying such intelligence are no longer heard. The periodical calls of animals, croaking of frogs, &c., afford the same reason for concluding that the sound of their voices, by elevation, depression, or modulation, conveys intelligence equivalent to an uttered sentence. The voices of birds seem applicable, in most instances, to the immediate necessities of their condition; such as the sexual call, the invitation to unite when dispersed, the moan of danger, the shriek of alarm, the notice of food."*

It was, no doubt, from such views as these, that the notion originated of birds being possessed of a language, and of a knowledge of it having been obtained by certain individuals. The faculty of interpreting the language of birds is attributed, in classic

* Journal of a Naturalist, p. 269, 3d edit.

fable, to various of the ancient diviners. Apollodorus, in his Bibliotheca, relates of Melampus, that he acquired this gift by having had his ears licked by serpents; and that one of the ways by which he chiefly gained a knowledge of futurity, was by listening to what he heard uttered by the birds as they flew over his head. Porphyry, in his book on abstinence from animal food, refers to Empedocles, Plato, and Aristotle, in support of the opinion that all the inferior animals are possessed both of reason and language; and, in addition to Melampus, he mentions Tiresias, Thales, and Apollonius of Tyanæ, as having been able to interpret what they said. This is affirmed to have been one of the gifts bestowed upon Tiresias, in compensation for his blindness, by Minerva. Some of the Jewish rabbis have attributed a similar power to King Solomon. Even as late as the seventeenth century we find the Irish monk, Bonaventure Baron, in his work in defence of Scotus, speaking of a brother Franciscan, who, he says, understood the language of beasts, and was enabled by that means to foretel coming events. The belief that birds are possessed of a knowledge of futurity, is part of the same notion which has led men to seek indications of what is about to happen in their flight and other movements, and which has given rise both to the ancient vaticination by augury, and to various popular superstitions which still survive. The power of communicating the gift of prophecy inherent in the serpent, was also a prominent article of the mystic creed of antiquity. The Trojan prophetess Cassandra is said to have acquired her art by having been left one night, when a child, together with her twin brother Helenus, in the temple of Apollo, when the two were found next morning with some serpents coiled round them and licking their ears. And Pliny, in his natural History, tells us that Democritus had mentioned the names of certain birds,

whose blood, being mixed together, would produce a serpent of such virtue, that any one who ate of it should understand whatever was said by birds when they conversed together. This story is alluded to by Addison in one of his Spectators.

It were to be wished that all fables in natural history were as obvious to an ordinary reader as this; for we meet with others in books wearing the air of well-ascertained facts, which could only originate in the fancy of the writers. This is exemplified in the story told of the butcher-bird (*Lanius excubitor*), which is said to imitate the voices of other birds, by way of decoying them within his reach, that he may devour them; "excepting this," it is added, "his natural note is the same throughout all seasons: when kept in a cage, even when he seems perfectly contented, he is always mute."* We venture to say, however, that nobody will ever be able to authenticate this statement, for the organs of the bird, were there no other obstacle, seem altogether incapable of the variety of modulation which the habit imputed to it would require, though, like most, if not all other birds, this species can express more than one sort of feeling.

CHAPTER XV.

SONGS OF BIRDS.

The songs of birds have given rise to several curious inquiries of no small interest to naturalists, some of which it may prove both amusing and instructive to detail. We may, however, begin by

* Anim. Biog., ii., 219.

stating, that, after investigating the subject with considerable attention for many years, we have come to the conclusion that the notes of birds which are denominated singing, may all be referred to hilarity and joy, or to rivalry and defiance, rather than to imitation or to love, as has been maintained by some naturalists of celebrity. Mr. Pennant gives the following view of the matter:

"It may be worthy," he says, "of observation, that the female of no species of birds ever sings; with birds it is the reverse of what occurs in human kind: among the feathered tribe, all the cares of life fall to the lot of the tender sex: theirs is the fatigue of incubation, and the principal share in nursing the helpless brood: to alleviate these fatigues, and to support her under them, nature hath given to the male the song, with all the little blandishments and soothing arts; these he fondly exerts (even after courtship), on some spray contiguous to the nest, during the time his mate is performing her parental duties. To these we may add a few particulars that fell within our notice during our inquiries among the birdcatchers, such as, that they immediately kill the hens of every species of birds they take, being incapable of singing."*

Buffon makes the qualified statement that "the females are much more silent than the males, song being generally withheld from them;" probably resting on the authority of Lord Bacon, who says "that male birds, among singing birds, are ever the better singers." The latter again most likely followed Aristotle, who says, "some males sing like their females, as appears among nightingales, but the female gives over song when she hatches." Daines Barrington, assuming it as a fact that females never sing, proceeds to divine the reason thereof, inferring it to be because it might betray their nest

* Brit. Zool., ii., 335.

should they sing while sitting on their eggs. But before drawing such a conclusion, it would have been well to make sure of the fact. It is certainly true as a general position, that female birds do not sing; yet many exceptions have been recorded. We possess, at present, in the same aviary with two greenbirds and an aberdevine (*Carduelis spinus*), a female canary who sings a great deal. Her notes indeed are harsh and unmusical, but are both loud and uttered in a full and sustained tone of voice, though altogether unlike the notes either of the male canary or of any other bird with which we are acquainted. It is no less worthy of remark, that this female canary is never excited to rivalry by the songs of a number of other birds in the same apartment, as the cocks of every species commonly are; for she usually remains silent during the attempts of the others to sing each other down, and prefers singing at night when the others are for the most part silent. We have also remarked, in birds reared from the nest, that the females will *record*, as it is termed, the first rehearsal, warbling in the low preluding manner peculiar to all birds some time before coming into full song. This was particularly the case with the greenbirds just mentioned, and one female greenbird will at present record in a similar manner, while her brother of the same age begins to sing in good earnest.

Mr. Sweet, the well-known botanical writer, and author of the "British Warblers," says that "females *seldom* sing: I had a female redstart which sang a little; and female bulfinches sing as frequently as the males." Again, Mr. Sweet says, "I have had several female birds which never attempted to sing; but now I have two that sing frequently; one is a female black-cap; she sings a note peculiar to herself, and not the least like the male, or any other bird with which I am acquainted. I kept her several years before she began to sing. I have

also a female willow-wren that sings nearly as much as the cock; this bird was bred up from the nest, and did not sing at all the first year. Her note is quite different from that of the male, but resembles it sufficiently to indicate that it belongs to the same species."* "In nightingales," says M. Montbeillard, "as in other species, there are females which enjoy some prerogatives of the male, and particularly participate of his song. I saw a female of that sort which was tame; her warble resembled that of the male, yet neither so full nor so varied; she retained it until spring, when, resuming the character of the sex, she exchanged it for the occupation of building her nest and laying her eggs, though she had no mate. It would seem that in warm countries, as in Greece, such females are pretty common, both in this species and many others; at least this is implied in a passage of Aristotle."

With respect, again, to Mr. Barrington's inference that the want of song in the female is for the purpose of concealing the eggs, Mr. Sweet farther says, "I certainly have never heard a thrush sing when sitting" (as had been asserted by a correspondent in a recent periodical work), "perhaps for want of attending to it; but I have frequently heard and seen the male black-cap sing while sitting on the eggs, and have found its nest by it more than once; the male of this species sitting nearly as much as the female." These well-authenticated facts, as well as more that we could adduce, are fatal to the theory.

St. Ambrose, on the other hand, asserts that "the nightingale, by the sweetness of her song, solaces herself during the long nights in which she is hatching her eggs, watchful and sleepless."

Another hypothesis advocated by several natural-

* Magazine of Nat. Hist., i., 346.

ists, and adopted by poets, is, that the singing of birds is the language of courtship and affection. "The song of male birds," says Buffon, "springs from the emotion of love: the canary in his cage, the greenbird in the fields, the oriole in the woods, chant their notes with a fond, sonorous voice, and their mates reply in more feeble strains." He adds, what is by no means the fact, that "the nightingale, when he first arrives in spring, is silent, begins with faltering, infrequent airs, and it is not till the dam sits on her eggs that he pours out the warm melody of his heart: then he relieves and sooths her tedious incubation; then he redoubles his caresses, and warbles with deeper pathos." On the contrary, we uniformly observe among the innumerable nightingales which annually arrive in our neighbourhood in spring, that the males sing out in as full, clear notes on their first appearance (usually many days before the arrival of the females) as they ever do afterward. Buffon concludes that his opinion derives additional support from the circumstance of song-birds becoming silent, or their notes being less sweet after the breeding season is over.

Another naturalist of eminence, Colonel Montagu, is more circumstantial in his arguments for the same opinion; and though we do not agree altogether with his explanations, the greater number of his facts are unquestionable. "The males of song-birds," he says, "and many others, do not, in general, search for the female; but, on the contrary, their business in the spring is to perch on some conspicuous spot, breathing out their full notes, which, by instinct, the female knows, and repairs to the spot to choose her mate. This is particularly verified with respect to the summer-birds of passage. The nightingale, and most of its genus, although timid and shy to a great degree, mount aloft, and incessantly pour forth their strains, each seemingly vying in its love-laboured song before

the females arrive. No sooner do they make their appearance than dreadful battles ensue, and their notes are considerably changed; sometimes their song is hurried through without the usual grace and elegance, at other times modulated into a soothing melody. The first we conceive to be a provocation to battle on the sight of another male; the last, an amorous cadence or courting address. This variety of song lasts no longer than till the female is fixed in her choice, which is, in general, in a few days after her arrival; and, if the season is favourable, she soon begins the task allotted to her sex.

"The male now no more exposes himself to sing as before, nor are his songs heard so frequently or so loud; but while she is searching for a secure place to build her nest in, he is no less assiduous in attending her with ridiculous gestures, accompanied with notes peculiarly soft. When the female has chosen a place for nidification, the male constantly attends her flight to and from the place, and sits upon some branch near, while his mate instinctively places the small portion of material she each time brings to rear a commodious fabric for her intended brood. When the building is complete and she has laid her portion of eggs, incubation immediately takes place. The male is now heard loud again, but not near so frequently as at first; he never rambles from her hearing, and seldom from her sight; if she leaves her nest, he soon perceives it, and pursues her, sometimes accompanied with soft notes of love. When the callow brood appears, he is instantly apprized of it, either by instinct, or by the female carrying away the fragment shells to some distant place. The male is now no more heard in tuneful glee, unless a second brood should force the amorous song again; his whole attention is now taken up in satisfying the nutrimental calls of his tender infant race, which he does with no less assiduity than his mate, carrying them food, and re-

turning frequently with the muting of the young in his beak, which is dropped at a distance from the nest."*

Plausible as this reasoning seems to be, it will not be difficult to adduce numerous facts with which it will not accord. It is not, indeed, a correct statement of the fact, to say that birds sing only during the seasons of pairing and breeding, as Buffon and Montagu assume. This is the case with the greater number of the seed-eating song-birds, both wild and tame; but not with the soft-billed birds. The redbreast sings as merrily during sharp frost as in the heyday of summer or in the mild sunshine of autumn. A much smaller and more delicate bird, the wren (*Anorthura communis*), also sings in all weathers during the autumn and winter, as well as the little dunnock (*Accentor modularis*); and they are frequently accompanied by the thrush and the blackbird. Though the latter do not sing so long and so frequently as in summer, this appears to be more on account of the physical languor arising from a precarious supply of food than from its not being the pairing season.

"We have one little bird," says Mr. Knapp, "the woodlark (*Alauda arborea*), that in the early parts of the autumnal months delights us with its harmony; and its carols may be heard in the air commonly during the calm sunny mornings of this season. They have a softness and quietness perfectly in unison with the sober, almost melancholy stillness of the hour. The skylark also sings now, and its song is very sweet, full of harmony, cheerful as the blue sky and gladdening beam in which it circles and sports, and known and admired by all; but the voice of the woodlark is local, not so generally heard from its softness, must almost be listened for to be distinguished, and has not any pretensions to

* Ornithological Dict., Intr. 1st ed.; p. 476, 2d ed.

the hilarity of the former. This little bird sings likewise in the spring."*

The researches of comparative anatomy have thrown much light upon the peculiar structure of song-birds, though there remain still many points of interest for future investigation. This, indeed, was a subject taken up by the earlier naturalists, and most of their observations have been subsequently confirmed and extended. Among other curious facts, it is stated in Clayton's Letters from Virginia, that Dr. Moulin discovered that in birds, contrary to what takes place in man and in quadrupeds, there is almost a direct passage from one ear to the other; so that, if the drum (*tympanum*) of both ears be pierced, water, when poured in, will pass from the one to the other. There is no spiral shell (*cochlea*), but a small passage which opens into a cavity formed by two plates of bone that constitute a double scull all round the head. The outer plate of bone is supported by many hundreds of small threadlike columns, or, rather, fibres. Now this passage was observed to be much larger in singing-birds than in others that do not sing; so very remarkably so, that any person to whom the difference has once been shown, may easily judge by the head what bird has the faculty of singing, though he may be otherwise ignorant of its habits.† We have not seen any notice of this singular circumstance by any other inquirer.

The remarks of Syme upon this subject are appropriate and, so far as we know, correct. "The notes," he tells us, "of soft-billed birds are finely toned, mellow, and plaintive; those of the hard-billed species are sprightly, cheerful, and rapid. This difference proceeds from the construction of the vocal organs. As a large pipe of an organ produces

* Journal of a Naturalist, p. 265, 3d edit.
† Miscellanea Curiosa, iii., 291.

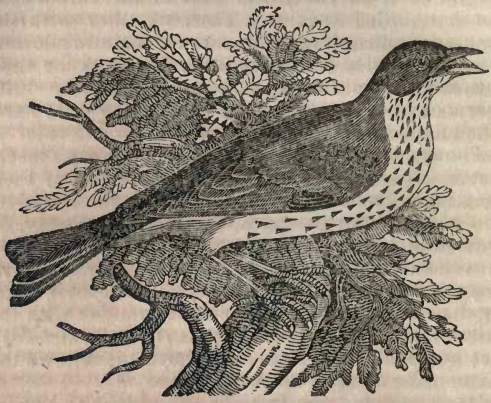
a deeper and more mellow-toned note than a small pipe, so the windpipe of the nightingale, which is wider than that of the canary, sends forth a deeper and more mellow-toned note. Soft-billed birds also sing more from the lower part of the throat than the hard-billed species. This, together with the greater width of the tube in the nightingale and other soft-billed warblers, fully accounts for their soft, round, mellow notes, compared with the shrill, sharp, and clear notes of the canary and other hard-billed song-birds."*

Though birds of the same species very closely resemble each other in the general tenour of their song, individuals differ widely both in the introduction of particular passages, the result, probably, of accidental acquirements, and in skill of execution as well as in intonation, the latter peculiarities obviously depending on physical varieties in their vocal organs. Wilson says he was so familiar with the notes of an individual wood-thrush (*Turdus melodus*), that he could recognise him above his fellows the moment he entered the woods.†

Mr. Knapp has the following excellent and accurate remarks on the same subject. "Birds," he says, "of one species sing, in general, very like each other, with different degrees of execution. Some counties may produce finer songsters, but without great variation in the notes. In the thrush, however, it is remarkable that there seems to be no regular notes, each individual piping a voluntary of his own. Their voices may always be distinguished amid the choristers of the copse, yet some one performer will more particularly engage attention by a peculiar modulation or tone; and should several stations of these birds be visited in the same morning, few or none, probably, will be found to pre-

* British Song-birds.
† Amer. Ornith.

serve the same round of notes, whatever is uttered seeming the effusion of the moment. At times a strain will break out perfectly unlike any preceding utterance, and we may wait a long time without no-



Wood-thrush.

ticing any repetition of it. During one spring an individual song-thrush, frequenting a favourite copse, after a certain round of tune, trilled out most regularly some notes that conveyed so clearly the words lady-bird! lady-bird! that every one remarked the resemblance. He survived the winter, and in the ensuing spring, the lady-bird! lady-bird! was still the burden of our evening song; it then ceased, and we never heard this pretty modulation more. Though merely an occasional strain, yet I have noticed it elsewhere; it thus appearing to be a favourite utterance."*

* Journal of a Naturalist, p. 271, 3d ed.

We have ourselves, in many instances, observed what might be not inappropriately called a different dialect among the same species of song-birds in different counties, and even in places a few miles distant from each other. This difference is more readily remarked in the chaffinch, dunnock, and yellow-hammer, than in the more melodious species. The chaffinches, for example, in Normandy, we observed to vary from those of Scotland by several notes; and among the yellow-hammers in Ireland, England, and Holland, we detected similar differences. We once heard a dunnock (*Accentor modularis*) in a garden at Blackheath sing so many additional notes to its common song, that we concluded it was of a different species, till we ascertained, by watching the little musician, that it was not otherwise distinguished from its less accomplished brethren. Of the chaffinch, Barrington says that those of Essex are more esteemed than others by the London birdcatchers; and Pennant tells us, he knew five guineas paid for one which had an uncommon note, under which it was intended to train others. In Italy, as we learn from M. Montbeillard, the linnets of Abruzzo and of the March of Ancona are preferred.

It must be from some peculiarities of this kind that the nightingales of Persia, Karamania, and Greece are said to sing better than those of Italy; while the Italian birds are more esteemed by amateurs than those of France, and the French than those of England. According to Pausanias, the nightingales which sing near the tomb of Orpheus are more melodious than elsewhere, and a similar superiority was also popularly believed to belong to those of Thrace. Both of these opinions are also maintained by Philostratus, though most probably no better founded than the legend current in Ireland, that the larks in the wild gloomy valley of Glandalough never sing, having been miraculously silen-

ced by St. Kevin during the building of the Seven Churches, because they broke the morning sleep of the wearied masons by their loud matin warblings.

In opposition to the popular notion founded on the theoretical reasoning of Buffon, M. Vaillant remarks, "It is quite a prejudice that the birds of warm climates are more brilliant than ours; witness our kingfisher and jay; or that they do not sing; for the song-birds, both in Africa and America, equal, and often surpass, our European birds. The traveller, Bruce also tells us that the song of the lark in Abyssinia did not appear to differ from that of the European larks; and M. Savigny, as we have already mentioned, heard the white-throat singing in Egypt. All the Oriental poets, indeed, introduce the music of the groves as an indispensable accompaniment in their finest descriptions. King Solomon says, "The time of the singing of birds is come, and the voice of the turtle is heard in our land;" and the naturalist, Haselquist, found nightingales in Palestine, as M. Le Marie had done in Africa. The Persian poet Hafiz, also, as well as the author of the "Ramayuna," and the Hindoo dramatist who wrote "Sacontala," are loud in their praises of the music of birds, while in the Koran and the Arabian Tales they are often mentioned.

In speaking of the wood-thrush (*Turdus melodus*) of America, Wilson indignantly repels the assertions of Buffon, who represents this bird as destitute of any note but a single scream, and hence draws an argument for his absurd theory of its being the song-thrush of Europe, degenerated by food and climate, so that its cry is now harsh and unpleasant, as are, he says, the cries of all birds that live in wild countries, inhabited by savages. Wilson's description of the song of this bird is well worth giving. "This sweet and solitary songster," he says, "inhabits the whole of North America, from Hudson's Bay to the

Peninsula of Florida. He arrives in Pennsylvania about the 20th of April or soon after, and returns to the South about the beginning of October. But, at whatever time the wood-thrush may arrive, he soon announces his presence in the woods. With the dawn of the succeeding morning, mounting to the top of some tall tree, that rises from a low, thick-shaded part of the woods, he pipes his few but clear and musical notes in a kind of ecstasy; the prelude or symphony to which strongly resembles the double-tonguing of a German flute, and sometimes the tinkling of a small bell; the whole song consists of five or six parts, the last note of each of which is in such a tone as to leave the conclusion evidently suspended; the finale is finely managed, and with such charming effect as to sooth and tranquillize the mind, and to seem sweeter and mellower at each successive repetition. Rival songsters of the same species challenge each other from different parts of the wood, seeming to vie for softer tones and more exquisite responses. During the burning heat of the day they are comparatively mute; but in the evening the same melody is renewed and continued long after sunset. Those who visit our woods, or ride out into the country at these hours, during the months of May and June, will be at no loss to recognise, from the above description, this pleasing musician. Even in dark, wet, and gloomy weather, when scarce a single chirp is heard from any other bird, the clear notes of the wood-thrush thrill through the drooping woods from morning till night; and it may truly be said, that the sadder the day the sweeter is his song."*

There are upward of twenty other American birds which Wilson characterizes in the same graphic manner; such as the brown thrush (*T. rufus*), whose song is emphatic, full of variety, and so loud

* Amer. Ornith., i., 33.

that in a serene morning, when the wind is hushed, and before "the busy hum of men" begins, his voice may be distinguished at the distance of half a mile; the migratory thrush (*T. migratorius*), who is an early songster, frequently commencing before the snow has disappeared, and perching on a stake or fence to begin the prelude to the general concert; the Baltimore oriole (*Oriolus Baltimorus*), whose notes consist of a clear mellow whistle, repeated at short intervals as he gleams among the branches, characterized by a certain wild plaintiveness and interesting simplicity, like that of a careless plough-boy whistling for amusement, and that even among the poplars of the American streets, amid the din of coaches, and wheelbarrows, and the bawling of oyster-women; the Virginian nightingale (*Loxia cardinalis*), who sings from March till September with great clearness, melody, vivacity, variety, and sprightliness, many of his notes being as loud as those of a fife; and the song sparrow (*Fringilla melodia*), by far the earliest, the most unwearied, and sweetest of the American song-birds, whose notes resemble the beginning of the canary's song. But we may mention another instance still more adverse to the theory, that, namely, of the ricebird (*Emberiza oryzivora*), which is found not only in the more temperate latitudes, but in Jamaica, and, we believe, other tropical localities. His song is highly musical; and mounting and hovering on the wing, at a small height above ground, he chants out a jingling melody of varied notes, as if half a dozen birds were singing together. Some idea may be formed of it by striking the high keys of a piano-forte singly and quickly, making as many contrasts as possible of high and low notes. Many of the tones are delightful, but the ear can with difficulty separate them. The general effect of the whole is good; and, when ten or twelve are singing on the same tree, the concert is singularly pleasing. These examples are

sufficiently conclusive against the theory that there are none or only inferior song-birds in the forests of America.

CHAPTER XVI.

IMITATION AND MIMICRY OF BIRDS.

"MIMICRY," says Lord Chesterfield, "which is the common and favourite amusement of little, low minds, is in the utmost contempt with great ones. It is the lowest and most illiberal of all buffoonery; we should neither practice it nor applaud it in others."* Yet, in despite of his lordship's authority, mimicry and imitation are and will be practised, and relished and applauded so long as men continue to receive pleasure from exercising their minds in making comparisons; for this exercise is always pleasing in proportion to the activity of mind, or the flow of associated ideas thereby produced, perhaps the true origin, indeed, of all our mental pleasures.

All this may be true so far as it goes; but the pleasure of making comparisons is only a particular instance of the pleasure we have in perceiving similitude in dissimilitude, or sameness combined with variety; and this is the true principle of the phenomenon under consideration.

If we hear a parrot utter an imitation of the words "Pretty Poll," we immediately trace a series of resemblances or differences between the pronunciation of the words by the parrot and by a man; and if the bird comes near the sound, we are pleased in tracing the resemblance, while we admire

* Letters, vol. ii.

the successfulness of the effort in accomplishing what might be previously supposed a difficult task for a bird, the overcoming of any difficulty having always the effect of exciting proportional admiration, from the sympathy of the passive spectator with the active agent, who feels his incapability of executing the same feat in all its particulars.

A story is told of Goldsmith, that having gone with Johnson and Burke to see an exhibition of puppets, his vanity was hurt at their praising the agility displayed by the figures, which, with characteristic simplicity, he volunteered to equal, and began accordingly, in good earnest, to skip over the chairs in the room, without reflecting that it was not exactly the agility that had pleased them and drawn forth their admiration, but the imitation of living actions, producing in their minds a train of comparison between the puppets and the motions of the animals imitated.

The truth of these views appears to be proved by the fact, that when the imitation is so perfect as to amount to a belief of its identity with what is imitated, no pleasure is produced by an observer, in consequence of his mind not being excited to institute a train of comparisons. In the case of the parrot, when the words are heard while the bird is unseen, the articulation never so nearly imitates humanity as to prevent the hearer from immediately recognising the voice to be that of a bird; but were the imitation perfect (supposing the bird still unseen), instead of a hearer going into a comparison respecting the imitation, he would immediately infer that the words "Pretty Poll" were uttered by some person calling to a parrot, rather than suppose them to be uttered by a bird. We recollect an instance of a starling, which had been taught by an Ayrshire hairdresser to repeat the words "Get up, sir," with surprising correctness of articulation. The tone of voice was husky and whispering, and

the first time we heard it from the bird, hanging in a dark corner of the shop, we could not imagine whence the words proceeded, and were led to fancy that it might be some idiot boy repeating, as is common in such cases, his favourite phrase; but no sooner did we learn the truth, than the correctness of the execution became a matter of comparison and of wonder.

But whatever may be the cause of the pleasure we take in hearing such imitations by birds, both of the sounds of one another and of animals of a different order, they are in many cases possessed of considerable interest. In Kent, Norfolk, and some other parts of England, the black-cap and the fauvette (*Philomela hortensis*) are both called the mock nightingale, under the notion, probably, of their imitating its song; but no person who is well acquainted with the nightingale's song could for a moment suppose the notes of either of these two birds to be an imitation of it, though they are both delightful songsters, and one of each species, at the time we write this, is trying to excel the other, in the garden opposite to our study.

Another English bird, the sedgebird (*Ripæcola salicaria*), is represented as a genuine mockbird. "The artificial notes," it has been remarked, "which wild birds acquire by imitation, are seldom altogether perfect, and may, in most cases, be recognised as imitations. This remark is confirmed by the fact, that mockbirds, which may be considered as having no natural songs of their own, cannot go through with any set of notes without introducing tones foreign to the notes they are imitating. The mockbird of this country" (*Ripæcola salicaria*), "whose retired habits cause it to be but little attended to, may be heard hurrying over in succession the song of the wren, wagtail, and skylark, the twitter of the swallow, and the chirp of the sparrow and the chaffinch; but it often introduces a deep

harsh note, which belongs to no other native bird, though it has a distant resemblance to the *chirr* of the whitethroat. Indeed, the mockbird, both in its size and colour, as well as in its habits, is so like the whitethroat as to be often confounded with it."*

There are several American birds, however, much more celebrated as mockers or imitators than this little sedgebird. We shall only particularize three, the polyglot-chat, the blue-jay, and the bird universally designated the mocking-bird.

The Polyglot-Chat.

The polyglot-chat (*Pipra polyglotta*, WILSON) was

* Edin. Mag., Jan., 1819, p. 10.

first observed and figured by Catesby, who discovered its singular manners by the difficulty he had in shooting one. He observed also that it is no less adroit in dancing than in the varied modulations of its voice. "It is," says Wilson, in a highly characteristic sketch, "a very singular bird. In its voice and manners, and the habit it has of keeping concealed while shifting and vociferating around you, it differs from most other birds with which I am acquainted, and has considerable claims to originality of character. It arrives in Pennsylvania about the first week in May, its term of residence here being scarcely four months. When he has once taken up his residence in a favourite situation, which is almost always in close thickets of hazel, brambles, vines, and thick underwood, he becomes jealous of his possessions, and seems offended at the least intrusion; scolding every passenger as soon as they come in view, in a great variety of odd and uncouth monosyllables, which it is difficult to describe, but which may be readily imitated so as to deceive the bird himself, and draw him after you for a quarter of a mile at a time, as I have sometimes amused myself in doing, and frequently without once seeing him. On these occasions his responses are constant and rapid, strongly expressive of anger and anxiety; and while the bird itself remains unseen, the voice shifts from place to place among the bushes, as if it proceeded from a spirit. First are heard a repetition of short notes, resembling the whistling of the wings of a duck or teal, beginning loud and rapid, and falling lower and slower till they end in detached notes; then a succession of others, something like the barking of young puppies, is followed by a variety of hollow guttural sounds, each eight or ten times repeated, more like those proceeding from the throat of a quadruped than that of a bird; which are succeeded by others not unlike the mewing of a cat, but consid-

erably hoarser. All these are uttered with great vehemence, in such different keys, and with such peculiar modulations of voice, as sometimes to seem at a considerable distance, and instantly as if just beside you; now on this hand, now on that; so that, from these manœuvres of ventriloquism, you are utterly at a loss to ascertain from what particular spot or quarter they proceed. If the weather be mild and serene, with clear moonlight, he continues gabbling in the same strange dialect, with very little intermission, during the whole night, as if disputing with his own echoes, but probably with a design of inviting the passing females to his retreat; for, when the season is farther advanced, they are seldom heard during the night.

"While the female chat is sitting, the cries of the male are still more loud and incessant. When once aware that you have seen him, he is less solicitous to conceal himself, and will sometimes mount up into the air, almost perpendicularly, to the height of thirty or forty feet, with his legs hanging; descending, as he rose, by repeated jerks, as if highly irritated, or, as is vulgarly said, 'dancing mad.' All this noise and gesticulation we must attribute to his extreme affection for his mate and young; and when we consider the great distance which in all probability he comes, the few young produced at a time, and that seldom more than once in a season, we can see the wisdom of Providence very manifestly in the ardency of his passions."*

We have introduced this description more to show the variety of note and voice which actually occurs in a bird, than as exhibiting an instance even of alleged imitation; for though it is said some of the sounds uttered by the polyglot-chat are "something like the barking of young puppies," and "others not unlike the mewing of a cat," it is not averred,

* Am. Ornith., i., 92.

as it is in the case of the bird called the mocking-bird, that these sounds are derived from imitation.

We have elsewhere taken notice of some interesting peculiarities in the American blue-jay (*Garrulus cristatus*, Brisson), and shall now advert to what is said of its powers of imitation and mimicry. "In the charming season of spring," says Wilson, "when every thicket pours forth harmony, the part performed by the jay always catches the ear. He appears to be, among his fellow-musicians, what the trumpeter is in a band, some of his notes having no distant resemblance to the tones of that instrument. Thus he has the faculty of changing through a great variety of modulations, according to the particular humour he happens to be in. When disposed for ridicule, there is scarce a bird whose peculiarities of song he cannot tune his notes to. When engaged in the blandishments of love, they resemble the soft chatterings of a duck, and while he nestles among the thick branches of the cedar, are scarce heard at a few paces distance; but no sooner does he discover your approach, than he sets up a sudden and vehement cry, flying off, and screaming with all his might, as if he called the whole feathered tribes of the neighbourhood to witness some outrageous usage he had received. When he hops undisturbed among the high branches of the oak and hickory, they become soft and musical; and his calls of the female a stranger would readily mistake for the repeated creakings of an ungreased wheelbarrow. All these he accompanies with various nods, jerks, and other gesticulations, for which the whole tribe of jays are so remarkable.

"He is not only bold and vociferous, but possesses a considerable talent for mimicry, and seems to enjoy great satisfaction in mocking and teasing other birds, particularly the little hawk (*Falco sparverius*), imitating his cry wherever he sees him, and

squealing out as if caught; this soon brings a number of his own tribe around him, who all join in the frolic, darting about the hawk, and feigning the cries of a bird sorely wounded and already under the clutches of its devourer; while others lie concealed in bushes ready to second their associates in the attack. But this ludicrous farce often terminates tragically. The hawk, singling out one of the most insolent and provoking, sweeps upon him in an unguarded moment, and offers him up a sacrifice to his hunger and resentment. In an instant the tune is changed; all their buffoonery vanishes, and loud and incessant screams proclaim disaster.

"Wherever the jay has had the advantage of education from man, he has not only shown himself an apt scholar, but his suavity of manners seems equalled only by his art and contrivances, though it must be confessed that his itch for thieving keeps pace with all his other acquirements. Dr. Mease, on the authority of Colonel Postell, of South Carolina, informs me that a blue-jay, which was brought up in the family of the latter gentleman, had all the tricks and loquacity of a parrot, pilfered everything he could conveniently carry off, and hid them in holes and crevices, answered to his name with great sociability when called on, could articulate a number of words pretty distinctly, and when he heard any uncommon noise or loud talking, seemed impatient to contribute his share to the general festivity (as he probably thought it) by a display of all the oratorical powers he was possessed of."*

The American mocking-bird attracted the notice of the earlier voyagers to the New World by the variety of its notes and the extraordinary compass and fineness of its voice, and, above, all by its apparent talent of mimicking the notes and cries of other birds and beasts. According also to Fernandez,

* Am. Ornith., i., 16.

Nieremberg, and Sir Hans Sloane, it is not satisfied with barely re-echoing the sounds imitated, but gives them a softness and grace not characteristic of the original, for which reason the Mexicans termed it the bird of four hundred tongues (*Cencontlatotli*). These writers also mention its mingling action with its song, accompanying the notes with measured movements expressive of successive emotions. In its preluding, it rises slowly with expanded wings, sinking back to the same spot, with its head hanging downward, as the skylark may sometimes be observed to do. When it has advanced farther in the performance, it ascends and descends on the wing in a spiral manner, and if the notes are brisk and lively, it describes in the air circles, crossing in all directions. When the notes are loud and rapid, it flaps its wings with proportional rapidity; and when the notes are unequal it bounds and flutters in unison; but as it becomes apparently tired of exertion, its tones soften by degrees, melt into tender strains, and die away in a pause which has a peculiarly fine effect, while at the same time it gradually diminishes its action, glides gently and smoothly above its station tree till the wavings of its wings become imperceptible, and finally ceasing, the little musician remains in the air suspended and motionless, as the kestril (*Falco tinnunculus*) may be seen to do when it watches for prey.

"I saw, heard, and admired," says Fernandez, "a small bird brought to Madrid, the queen of all singing birds that could command any voice or tune. It is not bigger than a *starling*, white underneath, brown above, with some black and white feathers intermixed, especially next the tail and about the head, which is encircled with the likeness of a silver crown. It is kept in cages to delight the ear, and for a natural rarity or rather wonder. It excels all birds in sweetness and variety of song and

perfect command of its voice, imitating the note of any sort of bird whatsoever, and excelling its exemplar. It goes far beyond the *nightingale*. I myself kept it a long time."

According to Goldsmith, who appears to speak from private information, as he does not here, as usual, translate nor follow Buffon, the mocking-bird "is possessed not only of its own natural notes, which are musical and solemn, but it can assume the tone of every other animal in the wood, from the wolf to the raven. It seems even to sport itself in leading them astray. It will at one time allure the lesser birds with the call of their mates, and then terrify them, when they have come near, with the screams of the eagle. There is no bird in the forest but it can mimic, and there is none that it has not at times deceived by its call. But, not like such as we usually see tamed for mimicking with us, and who have no particular merit of their own, the mockbird is ever surest to please when it is most itself. At those times it usually frequents the houses of the American planters; and, sitting all night on the chimney top, pours forth the sweetest and the most various notes of any bird whatever."

Pennant assures us that he himself heard "a caged one" in England "imitate the mewing of a cat and the creaking of a sign in high winds," and that it not only sang, but danced, performing a great many gesticulations. He farther tells us that it imitates the notes of all birds, from the humming-bird to the eagle.

Southey, in a few lines, imbodies nearly all that the works we have quoted contain respecting this bird, which he calls

> "That cheerful one, who knoweth all
> The songs of all the winged choristers;
> And, in one sequence of melodious sounds,
> Pours all their music."

He adds in a note, that "a negress was once heard to exclaim, 'Please God Almighty, how sweet that mocking-bird sing! he never tire!' By day and night he sings alike; when weary of mocking others, the bird takes up its own natural strain, and so joyous a creature is it, that it will jump and dance to its own music."

By far the most circumstantial account, however, of this wonderful bird is given by Wilson in a characteristically graphic passage. "This celebrated and very extraordinary bird," he says, "in extent and variety of vocal powers, stands unrivalled by the whole feathered songsters of this or perhaps any other country; and shall receive from us all that attention and respect which superior merit is justly entitled to. The plumage of the mocking-bird, though none of the homeliest, has nothing gaudy or brilliant in it; and, had he nothing else to recommend him, would scarcely entitle him to notice; but his figure is well proportioned, and even handsome. The ease, elegance, and rapidity of his movements, the animation of his eye, and the intelligence he displays in listening and laying up lessons from almost every species of the feathered creation within his hearing. are really surprising, and mark the peculiarity of his genius. To these qualities we may add that of a voice full, strong, and musical, and capable of almost every modulation, from the clear mellow tones of the wood-thrush, to the savage scream of the bald eagle. In measure and accent he faithfully follows his originals; in force and sweetness of expression he greatly improves upon them. In his native groves, mounted on the top of a tall bush or half-grown tree, in the dawn of the dewy morning, while the woods are already vocal with a multitude of warblers, his admirable song rises pre-eminent over every competitor. The ear can listen to *his* music alone, to which that of all the others seems a mere

accompaniment. Neither is his strain altogether imitative. His own native notes, which are easily distinguishable by such as are well acquainted with those of our various song-birds, are bold and full, and varied seemingly beyond all limits. They consist of short expressions of two, three, or, at the most, five or six syllables, generally interspersed with imitations, and all of them uttered with great emphasis and rapidity; and continued, with undiminished ardour, for half an hour or an hour at a time. His expanded wings and tail, glistening with white, and the buoyant gayety of his action, arresting the eye, as his song irresistibly does the ear. He sweeps round with enthusiastic ecstasy: he mounts and descends as his song swells or dies away; and as my friend Mr. Bartram has beautifully expressed it, 'He bounds aloft with the celerity of an arrow, as if to recover or recall his very soul, expired in the last elevated strain.' While thus exerting himself, a bystander, destitute of sight, would suppose that the whole feathered tribe had assembled together on a trial of skill, each striving to produce his utmost effect, so perfect are his imitations. He many times deceives the sportsman, and sends him in search of birds that perhaps are not within miles of him, but whose notes he exactly imitates: even birds themselves are frequently imposed on by this admirable mimic, and are decoyed by the fancied calls of their mates, or dive with precipitation into the depth of thickets, at the scream of what they suppose to be the sparrow-hawk.

"The mocking-bird loses little of the power and energy of his song by confinement. In his domesticated state, when he commences his career of song, it is impossible to stand by uninterested. He whistles for the dog; Cæsar starts up, wags his tail, and runs to meet his master. He squeaks out like a hurt chicken, and the hen hurries about with hang-

ing wings and bristled feathers, clucking to protect its injured brood. The barking of the dog, the mewing of the cat, the creaking of a passing wheelbarrow, follow with great truth and rapidity. He repeats the tune taught him by his master, though of considerable length, fully and faithfully. He runs over the quaverings of the canary, and the clear whistlings of the Virginia nightingale or redbird, with such superior execution and effect, that the mortified songsters feel their own inferiority, and become altogether silent; while he seems to triumph in their defeat by redoubling his exertions.

"This excessive fondness for variety, however, in the opinion of some, injures his song. His elevated imitations of the brown-thrush are frequently interrupted by the crowing of cocks; and the warblings of the bluebird, which he exquisitely manages, are mingled with the screaming of swallows or the cackling of hens; amid the simple melody of the robin we are suddenly surprised by the shrill reiterations of the whip-poor-will; while the notes of the kildeer, the blue-jay, martin, Baltimore, and twenty others, succeed, with such imposing reality, that we look round for the originals, and discover, with astonishment, that the sole performer in this singular *concert* is the admirable bird now before us. During this exhibition of his powers, he spreads his wings, expands his tail, and throws himself around the cage in all the ecstasy of enthusiasm, seeming not only to sing, but to dance, keeping time to the measure of his own music. Both in his native and domesticated state, during the solemn stillness of night, as soon as the moon rises in silent majesty, he begins his delightful solo; and serenades us the livelong night with a full display of his vocal powers, making the whole neighbourhood ring with his inimitable medley."*

* Amer. Ornith., ii., 19.

It is rather a curious circumstance, characterizing, it would appear, the mocking-bird, as well as our European birds, that the species distinguished for singing seldom learn to imitate human speech; while those which do not sing, such as the jay, the magpie, and the parrot, are well known as successful imitators.

The gray parrot (*Psittacus erithacus*) which belonged to Colonel O'Kelly "not only," says Bingley, "repeated a great number of sentences, but answered many questions: it was also able to whistle many tunes. It beat time with all the appearance of science; and so accurate was its judgment, that if by chance it mistook a note, it would revert to the bar where the mistake was made, correct itself, and, still beating regular time, go through the whole with wonderful exactness. Its death was thus announced in the General Evening Post for the 9th of October, 1802: 'A few days ago died, in Half Moon-street, Piccadilly, the celebrated parrot of Colonel O'Kelly. This singular bird sang a number of songs in perfect time and tune; she could express her wants articulately, and give her orders in a manner approaching nearly to rationality. Her age was not known; it was, however, more than thirty years, for previously to that period Mr. O'Kelly bought her at Bristol for a hundred guineas. The colonel was repeatedly offered five hundred guineas a year for the bird, by persons who wished to make a public exhibition of her; but this, out of tenderness to the favourite, he constantly refused."

There are many persons now alive who have witnessed these scarcely credible performances. Among these, the Rev. W. H. Herbert says: "That wonderful bird, Colonel O'Kelly's parrot, which I had the satisfaction of seeing and hearing (about the year 1799, if I recollect rightly), beat the time always with his foot, turning round upon the perch

while singing, and marking the time as it turned. This extraordinary creature sang perfectly about fifty different tunes of every kind, 'God save the King,' solemn psalms, and humorous or low ballads, of which it articulated every word as distinctly as a man could do, without even making a mistake. If a bystander sang any part of the song, it would pause and take up the song where the person had left off without repeating what he had said. When moulting and unwilling to sing, it would answer all solicitations by turning its back and repeatedly saying, 'Poll's sick.' I am persuaded that its instructer had taught it to beat time."*

It would be easy to fill a volume with anecdotes of parrots and other speaking birds, though many of them are evidently much over-coloured. We shall only add one more, on the respectable authority of Mr. Syme, who tells us he "went one morning, with a friend, to see a collection of birds belonging to a gentleman in Antigua-street, Edinburgh, and among these were some very fine starlings; one, in particular, which cost five guineas. Breakfast was ready before we entered the room. When the bird was produced, it flew to its master's hand, and distinctly pronounced, 'Good-morning, sir—breakfast—breakfast.' It afterward hopped to the table, examined every cup, and, while thus employed, it occasionally repeated, 'Breakfast—breakfast—bread and butter for Jack—tea, tea—bread for Jack—pretty Jack—pretty Jack.' One thing we observed was this: it often said the same word or sentence twice over, perhaps in imitation of the person by whom it had been taught."*

* Notes to White's Selborne, 8vo. edit., 1832.
† British Song Birds, p. 63.

CHAPTER XVII.

LONGEVITY OF BIRDS.

It is, as well remarked by Mr. Knapp, "difficult, from many circumstances, to form an accurate statement of the natural duration of animal life, the wild creatures being, in great measure, removed from observation, and those in a condition of domestication being seldom permitted to live as long as their bodily strength would allow. It was formerly supposed that the length of animal life was in proportion to the space it remained in the parent, from conception to birth, and the length of time it required to obtain maturity. This notion might have some support in reason and fact occasionally, but in many cases was incorrect; and, in regard to birds, had no foundation. Herbivorous animals probably live longer than carnivorous ones, vegetable food being most easily obtainable in all seasons, in a regular and requisite supply; whereas animals that subsist on flesh, or by the capture of prey, are necessitated at one period to pine without food, and at another gorged with superfluity: and, when the bodily powers of rapacious creatures become impaired, existence is difficult to support, and gradually ceases; but with herbivorous animals in the same condition, supply is not equally precarious or wholly denied. Yet it is probable that few animals, in a perfectly wild state, live to a natural extinction of life. In a state of domestication, the small number of carnivorous creatures about us are sheltered and fed with care, seldom are in want of proper food, and at times are permitted to await a gradual decay, continuing as long as nature permits, and by

such attentions many have attained to a great age; but this is rather an artificial than a natural existence. Our herbivorous animals, being kept mostly for profit, are seldom allowed to remain beyond approaching age; and when its advances trench upon our emoluments by diminishing the supply of utility, we remove them. The uses of the horse, though time may reduce them, are often protracted; and our gratitude for past services, or interest in what remains, prompts us to support his life by prepared food, for easy digestion, or requiring little mastication; and he certainly by such means attains to a longevity probably beyond the contingencies of nature. I have still a favourite pony—for she has been a faithful and able performer of all the duties required of her in my service for upward of two-and-twenty years—and, though now above five-and-twenty years of age, retains all her powers perfectly, without any diminution or symptom of decrepitude; the fineness of limb, brilliancy of eye, and ardour of spirit, are those of the colt; and, though treated with no remarkable care, she has never been disabled by the illness of a day, or sickened by the drench of the farrier. With birds it is probably the same as with other creatures; and the eagle, raven, parrot, &c., in a domestic state attain great longevity; and though we suppose them naturally tenacious of life, yet, in a really wild state, they would expire before the period which they attain when under our attention and care. And this is much the case with man, who probably outlives most other creatures; for though excess may often shorten, and disease or misfortune terminate his days, yet naturally he is a long-lived animal. His 'threescore years and ten' are often prolonged by constitutional strength, and by the cares, the loves, the charities of human nature. As the decay of his powers awakens solicitude, duty and affection in-

crease their attentions, and the spark of life only expires when the material is exhausted."*

The birds most celebrated for longevity are the raven, the pelican, and the eagle, though the evidence which we have met with, in proof of the common opinion respecting the long life of these birds, is not always so satisfactory as we could wish. To these may be added the skylark, which has been known to live in a cage, as Olina says, ten years; while Raczynski mentions an instance in which one lived twenty-four years.

In his chapter on "The Longest Lives," Pliny says, "Hesiod (the first writer, as I take it, who hath treated of this argument, and yet like a poet), in his fabulous discourse touching the age of man, said, forsooth, that a crow lives nine times as long as we; and harts or stags four times as long as he, but ravens thrice as long as they." If we estimate accordingly a generation at thirty years, the age of the crow would be 270 years, that of the stag 1080 years, and that of the raven 3240 years; but if we interpret the terms used by both Hesiod and Pliny to signify a year, we should then have the life of the crow nine years, and of the raven 108, which is probably nearer the truth.

"No person, as far as I know," says Montbeillard, "has determined the age at which the young ravens have acquired their full growth and are capable of propagating. If in birds, as in quadrupeds, each period of life was proportional to the total space of existence, we might suppose that the crows required many years to reach their adult state, though it seems well ascertained that this bird sometimes lives a century or more. In many cities of France they have been known to attain to that distant period; and in all countries and all ages they have been reckoned as birds extremely long-

* Journ. of a Nat., p. 181, 1st edit.

lived. But the progress to maturity must be slow in this species, compared to the duration of their life; for towards the end of the first summer, when all the family consort together, it is difficult to distinguish the old from the young, and very probably they are capable of breeding the second year."

Pigeons are reported to have lived from twenty to twenty-two years; and even linnets, goldfinches, and other small birds, have been known to live from fifteen to twenty-three years.

Willoughby says, "We have been assured by a friend of ours, a person of very good credit, that his father kept a goose, known to be fourscore years of age, and as yet sound and lusty, and like enough to have lived many years longer, had he not been forced to kill her for mischievousness, worrying and destroying the young geese and goslins." In another part of his valuable work, this writer tells us, "that he has been assured by credible persons, that a goose will live a hundred years and more."

It has been supposed that the pelican derives its great longevity from the peculiar texture of its bones, which are thin, almost transparent, and exceedingly light. Even in captivity it has been observed to be more tenacious of life than most other birds. "Of a great number of pelicans kept in the menagerie at Versailles, none died in the space of twelve years; yet during that time some of almost every other species of animals died."

It was reported, as Aldrovand has stated, by persons worthy of credit, that a pelican, eighty years of age (*octogenariam*), was kept by the emperor Maximilian, and was held as a sort of auspicator in his camp. It was supposed to have been hatched in the time of Philip the emperor's father. It was afterward kept for a long time at the court of the empress, after it was no longer able, through old age, to use its wings, the expense of keeping it being four crowns a day. Turner mentions one which

lived fifty years; and Raczynski another, kept at the court of Bavaria for forty years.

"Eagles," says Pennant, "are remarkable for their longevity, and for their power of sustaining a long abstinence from food. A golden engle, which has now been nine years in the possession of Owen Holland, Esq., of Conway, lived thirty-two years with the gentleman who made him a present of it; but what its age was when the latter received it from Ireland is unknown. The same bird also furnishes a proof of the truth of the other remark, having once, through the neglect of servants, endured hunger for twenty-one days, without any sustenance whatsoever."

The great age of the eagle is beautifully alluded to in the Psalms, where it is said of the righteous man that "his youth is renewed like the eagle's," a passage which greatly exercised the ingenuity of the ancient fathers and other commentators in fancying the manner in which the eagle did renew its youth. The greater number of them, and among these, St. Jerome, St. Ambrose, St. Gregory, Nicephorus, and Rabbi David, say that when the bird begins to feel advancing age from the weight of its feathers and the dimness of its eyes, it betakes itself to a fountain of water, and, plunging therein, has its whole frame renovated. St. Damian adds, that before immersion, it so places itself in the focus of the sun's rays (*ad circulum solis*) as to set its wings on fire, and in this way to consume the old feathers; proving pretty plainly that St. Damian was not aware of the natural mode of birds renewing their feathers by moulting. Rabbi David adds, that when it delays the operation too long it has not strength to rise from the water, and is frequently drowned.

St. Augustine says, that when the eagle becomes very old, the upper mandible of the beak grows so long that the bird can no longer feed, in which case

it betakes itself to a rock or rough stone, and rubs its beak till the overgrown part is ground down into proper proportion.

Albertus Magnus gives a still more ingenious process of renewal, not, however, of his own invention, but quoted from Jorachus and Andelinus, whose works, we presume, are now lost. "They say," reports Albertus, "that an old eagle at the period the young ones are fledged, as soon as she has discovered a clear and copious spring, flies directly upward, even to the third region of the air, which we term the region of meteors, and when she feels warm, so as to be almost burning, suddenly dashing down and keeping her wings drawn back, she plunges into the cold water, which, by the astringing of the external cold, increases the internal heat. She then rises from the water, flies to her nest, and nestling under the wings of her warm young ones, melts into perspiration, and thence with her old feathers she puts off her old age, and is clothed afresh; but while she undergoes this renovation, she makes prey of her young for food. But I can only," he adds, "consider this as a miraculous occurrence, since in two eagles which I kept I observed no changes of this sort; for they were tame and docile, and moulted in the same manner as other birds of prey."

It is very obvious that all these are mere fancies, and farther, that there are few or no data by which to determine the age of wild birds. We have, indeed, observed among house-sparrows individual cockbirds, in which the black markings were intermixed with white feathers: but whether this was the hoariness of age, or merely an accidental variety of colour, we had no means of ascertaining. It has been long decided that the grayheaded crow is not an old carrion crow grown hoary with age as is popularly believed; but a different species (*Corvus cornix*).

THE

FACULTIES OF BIRDS.

CHAPTER XVIII.

VISION OF BIRDS.

The animals most celebrated for piercing sight are the eagle and the lynx; but if the acute vision of the eagle rested on no better authority than that of the lynx, we should not be disposed to rely on its accuracy, though old Aldrovand says that "nobody of sound mind will deny the lynx to be the clearest sighted of all quadrupeds, since all naturalists are agreed upon the point." There can be little doubt, however, that the agreement thus quoted as an authority sprung from reading and copying rather than from observation; or, perhaps, as Gesner seems to think, from the similarity of the name to Lynceus, whom the poets fable to have been able to look through trees, walls, and rocks, and even, if we credit Apollonius, to see into the very bowels of the earth. Observation proves that the sight of the lynx (*Felis cervaria*, Temminck, and *F. Lynx*, Linn.) is similar, and little, if at all, superior to that of the cat or the tiger; and, as it pursues its prey in the night, its eyes, though in appearance "brilliant," as Buffon correctly says, are ill fitted for vision except during twilight.

The proverbial piercing sight of the eagle rests upon very different evidence from that of these fa-

bles. Systematic writers afford little information on the subject; but we have abundant proof of this intensity of vision from other sources. We may, however, reasonably doubt the fact of its fixing its gaze upon the sun, the "naked sun," as Petrarch gives it, even though the authority of Scaliger tells us that having "repeatedly placed an eagle in the sun, it gazed on its rays for a long time intensely and pertinaciously." It does not appear what motive can induce the bird to gaze on the sun, even if it have the power. Larks, indeed, and some other small birds, are attracted by bright objects, as is proved by what birdcatchers call *daring*, that is, fixing a piece of looking-glass on a moveable pivot and whirling it round; but in this case it is probable the larks are allured by the principle of curiosity so very lively in birds. On the general physiological principle, also, that the more stimulus an organ can bear the less sensible it must be, we may conclude that the two circumstances of piercing sight and capability to gaze on the sun are incompatible. Accordingly, we find that animals which prey in the night, and white animals with red eyes (*albinos*), while they can see with a faint glimmer of light on account of their extreme sensibility of vision, are so overpowered by the glare of the sun's light that they can scarcely see at all.

There is, indeed, a peculiarity in the eyes not only of the eagle, but of all birds, tending to defend them from too strong light, to which it may be interesting to advert. In the eye of man and many other animals, including birds, a beautiful provision is made for supplying it with the moisture which is indispensable to render its restless motions easy. For this purpose a fountain or gland, situated in man within the upper and outer part of the bony socket, affords a constant supply of tears, about three or four ounces of which it has been computed are discharged upon the human eyeball every twenty-

four hours. Besides this, there is an ointment prepared in the beautiful little glands, about thirty in number, interspersed within the fine skin of the inner eyelid near to the roots of the eyelashes, appearing when magnified like studs of minute pearls. This ointment, which, according to M. Magendie, is of a glairy consistence, like white of egg, is dissolved and diluted by the tears, and the whole is constantly spread over the eyeball by the sweep of the eyelids, which act like valves, and are composed of semi-transparent muscular substance, attached to a ring of gristle or cartilage, which is hinged on the adjacent bone, and gives the eyelids firmness and preserves their shape. Our eyes are, besides, elegantly fringed with short hairs, either to defend the eye with a gratework from anything falling into it, or to perform some unknown operation on light. The use of the eyelids is strikingly demonstrated from what takes place when they are cut off, a savage punishment sometimes practised in barbarous countries. This prevents sleep, and, from the constant irritation of the light, the eyes inflame, the inflammation spreads to the brain, and the victim of torture expires in the most dreadful agony.

Birds differ considerably from other animals with respect to the eyelids, which are indeed formed horizontally and very distinct; but the under lid is in most birds much larger and more moveable than the upper, as was observed by Aristotle, in many cases forming on the inner surface a smooth, polished plate (*lamina*).

The part, however, which we have more particularly alluded to, we may with some propriety call the eyebrush (*membrana nictitans*). In our own eye we may examine this eyebrush at a looking-glass by turning the eye away as far as possible from the nose. It is a little red fleshy membrane, in form of a crescent, which in such a position of

the eye is spread over its inner angle, and when any dust has fallen upon the ball, it sticks to this and is carried into the corner of the eye by the membrane folding back. In birds, again, this eye-brush is much more extended, and is spread over the whole eye by means of two muscles, one forming a tendinous cylindrical canal, the other passing through this and working like a cord in a pulley. The membrane being translucent, when it is drawn over the eye like a curtain it is well calculated to prevent it from being dazzled by too much light. It is evidently, however, a mere conjecture that it is by means of this membrane the eagle can look at the sun; for we do not see how it could be proved by experiment, as it would be impossible to perceive through it the direction of the pupil. Aristotle was of opinion it was for the purpose of moistening the eye; but Aldrovand thinks we cannot well draw such an inference, as our own eye is kept sufficiently moist without such a provision.

Willoughby describes the eye of the golden eagle as having "a certain thick tunicle stretched forth from below upward, covering the globe in nictation. Two eyelids, one above, the other beneath, although the lower alone extending upward is sufficient to cover the whole eye. The region of the eyebrows is very eminent, like that prominent part of houses called the eaves, under which the eyes lie hidden, as it were, in a deep cavity. The eyes are of a green colour (*chlorops*) of a fiery splendour, shining forth in a pale blue. The pupil is of a deep black. It is very admirable to observe what care nature hath taken, and what provision she hath made for the conservation of the eyes, than which there is no part in this animal more excellent; for not being content with one tegument, as is usual in other animals, she seemeth to have framed four several lids or covers for them. The membrane for nictation is the same thing, and af-

fords the same use to them that the eyelids do to man. Besides which nature hath superadded two other eyelids, and of these the lower so large that they alone suffice to cover and preserve the eye."*

Willoughby thinks it "partly false or uncertain," that the golden eagle "doth so excel in quick-sightedness, soaring so high in the air that she can very hardly be discerned by us in all that light, yet she can espy a hare lying under a bush, or a little fish swimming in the water; though I grant," he adds, "that both the eagle and other rapacious birds are very sharp-sighted, yet do I not think that their eyes can reach the object at such distances."†

We may remark, however, with all deference to the high authority of Willoughby, that his skepticism is here carried too far, as the accounts he objects to are supported by undoubted facts. For, though we should reject the authority of Homer, who, as Pope renders it, says,

> "Endued with sharpest eye,
> The sacred eagle, from his walks above,
> Looks down and sees the distant thicket move,
> Then stoops, and sousing on the quivering hare,
> Snatches his life;"‡

and though we should doubt the testimony of Aurelius Augustine, who says that "the eagle, when so high in the air as to be invisible to us, can perceive a hare lurking in an orchard, or a small fish swimming in the water;" yet we cannot refuse to admit as unquestionable facts the observations of such men as Wilson and Vaillant. Speaking of the white-headed eagle (*Haliaëtus leucocephalus*, Savigny), Wilson says, "from the ethereal heights to which he soars, looking abroad, at one glance, on an immeasurable expanse of forests, fields, lakes, and ocean, deep below him;" and of the osprey (*Pandion haliaëtus*, Savigny), he says, "down rapid

* Ornithology, by Ray, p. 58. † Ibid., p. 57.
‡ Iliad, xvii.

as an arrow from heaven he descends, the roar of his wings reaching the ear as he disappears in he deep."* M. Vaillant again says of his vociferous eagle (*Haliaëtus vocifer*, Savigny), that, "like the ospray and the white-tailed eagle (*Haliaëtus albicilla*, Savigny), it dives rapidly from a great height in the air upon a fish which it descries."† We have ourselves more than once seen the osprey dash down from a height of two or three hundred feet upon a fish of no considerable size, and which a man could with difficulty have perceived at the same distance.‡

Ross, in his voyage to Baffin's Bay, proved that a man under favourable circumstances could see over the surface of the ocean to the extent of one hundred and fifty English miles. It is not probable that any animal exceeds this power of vision, though birds perhaps excel men and most quadrupeds in sharpness of sight. M. Schmidt threw, at a considerable distance from a thrush (*Turdus musicus*), a few small beetles, of a pale gray colour, which the unassisted human eye could not discover, yet the thrush observed them immediately and devoured them. The bottletit (*Parus caudatus*) flits with great quickness among the branches of trees, and finds on the very smooth bark its particular food, where nothing is perceptible to the naked eye, though insects can be detected there by the microscope. A very tame redbreast (*Rhondella rubecula*) discovered crumbs from the height of the branch where it usually sat, at the distance of eighteen feet from the ground, the instant they were thrown down, and this by bending its head to one side, and using, of course, only one eye. At the same distance a quail (*Coturnix major*, Brisson) discovered, with one eye, some poppy-seeds, which are very small and inconspicuous.

* American Ornith., v. † Oiseaux d'Afrique, i., 18.
‡ J. Rennie.

We have not a doubt it is by the eye alone that the carrier pigeon (*Columba tabellaria*, Ray) performs those extraordinary aerial journeys which have from the earliest ages excited astonishment. We have frequently witnessed the experiment made with other pigeons, of taking them to a distance from the dovecot, expressly to observe their manner of finding their way back, and we feel satisfied that their proceedings are uniformly the same. On being let go from the bag in which they have been carried, in order to conceal from their notice the objects on the road, they dart off on an irregular excursion, as if it were more to ascertain the reality of their freedom than to make an effort to return. When they find themselves at full liberty, they direct their flight in circles round the spot whence they have been liberated, not only increasing the diameter of the circle at every round, but rising at the same time gradually higher. This is continued as long as the eye can discern the birds, and hence we conclude that it is also continued after we lose sight of them, a constantly increasing circle being made till they ascertain some known object enabling them to shape a direct course.

It is not a little interesting to contrast the proceedings just described with those of a pigeon let off from a balloon elevated above the clouds. Instead of rising in circles like the former, the balloon pigeon drops perpendicularly down like a plummet, till it is able to recognise some indications of the earth below, when it begins to wheel round in a descending spiral, increasing in diameter for the evident purpose of surveying its locality, and discovering some object previously known by which to direct its flight.

The rapidity with which the carrier pigeon performs long journeys may, perhaps, be adduced as an objection to this explanation. M. Antoine, for example, tells us that a gentleman of Cologne, hav-

The Carrier Pigeon (*Columba tabellaria*).

ing business to transact at Paris, laid a wager of fifty Napoleans ($200) that he would let his friends know of his arrival within three hours, and as the distance is a hundred leagues, the bet was eagerly taken. He accordingly took with him two carrier pigeons which had young at the time, and on arriving at Paris at ten o'clock in the morning, he tied a letter to each of his pigeons, and despatched them at eleven precisely. One of them arrived at Cologne at five minutes past one o'clock, and the other nine minutes later, and consequently they had performed nearly a hundred and fifty miles an hour, reckoning their flight to have been in a direct line. But their rapidity was probably much greater if they took a circular flight, as we have concluded from the observation of facts. Audubon proves that the American passenger pigeon (*Columba migratoria*) can fly at least a mile in a minute, and this is a heavier bird than the carrier pigeon. The flight of the carrier pigeon, however, is, if we may trust to the facts recorded, very various. Lithgow, the traveller, tells us that one of them will carry a letter from Babylon to Aleppo (which is thirty days' journey) in forty-eight hours. In order to measure the speed of the bird, a gentleman some years ago sent one from London, by the coach, to a friend at Bury St. Edmunds, and along with it a note, desiring that the pigeon, two days after its arrival there, might be thrown up precisely when the town clock struck nine in the morning. This was accordingly done, and the pigeon arrived in London, and flew into the Bull Inn, Bishopsgate-street, at half past eleven, having flown seventy-two miles in two hours and a half, not half the speed, it may be remarked, of the Cologne pigeons above recorded.

The observations of Audubon on the passenger pigeon tend to confirm the view which we have taken. "Their great power of flight," he says, "enables them to survey and pass over an astonishing

extent of country in a very short time. This is proved by facts well known in America. Thus, pigeons have been killed in the neighbourhood of New-York with their crops full of rice, which they must have collected in the fields of Georgia and Carolina, these districts being the nearest in which they could have procured a supply of that kind of food. As their power of digestion is so great that they will decompose food entirely in twelve hours, they must, in that case, have travelled between three and four hundred miles in six hours, which shows their speed to be, at an average, about one mile in a minute. A velocity such as this would enable one of these birds, were it so inclined, to visit the European continent in less than three days.

"This great power of flight is seconded by as great a power of vision, which enables them, as they travel at that swift rate, to inspect the country below, discover their food with facility, and thus attain the object for which their journey has been undertaken. This I have also proved to be the case, by having observed them, when passing over a sterile part of the country, or one scantily furnished with food suited to them, keep high in the air, flying with an extended front, so as to enable them to survey hundreds of acres at once. On the contrary, when the land is richly covered with food, or the trees abundantly hung with mast, they fly low in order to discover the part most plentifully supplied. Their body is of an elongated oval form, steered by a long, well-plumed tail, and propelled by well-set wings, the muscles of which are very large and powerful for the size of the bird. When an individual is seen gliding through the woods, and close to the observer, it passes like a thought, and, on trying to see it again, the eye searches in vain; the bird is gone." "As soon," he adds, "as the pigeons discover a sufficiency of food to entice them to alight, they fly round in circles reviewing the country be-

low. During their evolutions on such occasions, the dense mass which they form exhibits a beautiful appearance as it changes its direction, now displaying a glistening sheet of azure, when the backs of the birds come simultaneously into view, and anon suddenly presenting a mass of rich, deep purple. They then pass lower over the woods, and for a moment are lost in the foliage, but again emerge and are seen gliding aloft."

The return of the carrier pigeon from such distances to its home is, we think, most plausibly accounted for by its flying in circles; but that there may be some other manner in which it is directed, is not improbable from what takes place among quadrupeds. Instances, for example, are not uncommon of cats having returned of their own accord to the place from which they have been carried, though at the distance of many miles, and even across rivers, where they could not possibly have had any knowledge either of the road or of the direction that would lead them to it. "The nature of this beast," says Gesner, "is to love the place of its breeding; neither will she tarry in any strange place, although carried far, being never willing to forsake the house for the love of any man, and most contrary to the nature of a dog, who will travel abroad with his master: but although their masters forsake their houses, yet will not these beasts (cats) bear them company; and, being carried forth in close baskets or sacks, they will return again."* We have thus known a cat to travel from London to Chatham in Kent, a distance of thirty miles; and most persons can relate similar incidents. Gesner, however, is not correct in confining this propensity to the cat, for dogs frequently do the same. D'Obsonville, in his curious work, mentions a remarkable instance in a mastiff. This dog, which he had brought

* History of four-footed Beasts, by Topsel, p. 82.

up in India from two months old, accompanied him and a friend from Pondicherry to Benglour, a distance of more than three hundred leagues. "Our journey," he goes on to say, "occupied nearly three weeks; and we had to traverse numerous plains and mountains, and to ford rivers and go along several by-paths. The animal, which had certainly never been in that country before, lost us at Benglour, and immediately returned to Pondicherry. He went directly to the house of M. Beylier, then commandant of artillery, my friend, and with whom I had generally lived. Now the difficulty is not so much to know how the dog subsisted on the road (for he was very strong and able to procure himself food), but how he could so well have found his way after an interval of more than a month."

A still more extraordinary instance of returning is recorded on the authority of Lieutenant Alderson, of the Royal Engineers, who was personally acquainted with the facts. In March, 1816, an ass, the property of Captain Dundas, R. N., then at Malta, was shipped on board the Ister frigate, Captain Forrest, bound from Gibraltar for that island. The vessel having struck on some sands off the Point de Gat, at some distance from the shore, the ass was thrown overboard to give it a chance of swimming to land; a poor one, for the sea was running so high that a boat which left the ship was lost. A few days afterward, however, when the gates of Gibraltar were opened in the morning, the ass presented himself for admittance, and proceeded to the stable of Mr. Weeks, a merchant, which he had formerly occupied, to the no small surprise of this gentleman, who imagined that, from some accident, the animal had never been shipped on board the Ister. On the return of the vessel to repair, the mystery was explained; and it turned out that Valiante (so the ass was called) had not only swam safely to shore, but, without guide, compass, or

travelling map, had found his way from Point de Gat to Gibraltar, a distance of more than two hundred miles, through a mountainous and intricate country, intersected by streams, which he had never traversed before, and in so short a period that he could not have made one false turn. His not having been stopped on the road was attributed to the circumstance of his having been formerly used to whip criminals upon, which was indicated to the peasants (who have a superstitious horror of such asses) by the holes in his ears, to which the persons flogged were tied.

It would appear, from an observation of Professor Lichenstein, that birds which feed on carrion may probably resort to making circular flights, similar to the pigeon, in order to discover a carcass. He remarked, when travelling in Southern Africa, that if an animal chanced to die in the very midst of the most desert wilderness, in less than half an hour there was seen high in the zenith a number of minute objects descending in spiral circles, and increasing in visible magnitude at every revolution. These were soon discovered to be a flight of vultures, which must have observed from a height, viewless to the human eye, the dropping of the animal immediately marked out for prey.

Dr. James Johnson mentions a fact illustrative of the same view. During the northeast monsoon, when the wind blew steadily in one point for months in succession, he observed a concourse of birds of prey from every point of the horizon hastening to a corpse that was floating down the river Ganges; and he accounts for their thus congregating, and appearing suddenly from immense distances, to their soaring high in the air for the purpose of looking out for food.

It is said in St. Matthew, as the received translation gives it, that " where the carcass is, there will

the *eagles* be gathered together;"* and in Job it is said, "where the slain is, there is she." Now it is well known that the eagle does not feed on carrion, and it has been proved, by experiment, that it will not touch it unless pressed by hunger. Yet Professor Paxton contends with St. Jerome that the eagle is certainly meant in the text, and quotes after Bochart, the Arabian historian Damir, who asserts that the eagle can discover a carcass at the distance of four hundred parasangs, with this singularity that if he find part of it have been previously eaten by the osprey, he will not touch the leavings of his inferior. This circumstance, as it appears to us, makes rather against than for Dr. Paxton's opinion, supposing the authority of Damir to be good. In consequence of this apparent discrepance between facts and the text, St. Chrysostom proposed to read "vultures" for "eagles," in the passages both in Matthew and Job. Aldrovand, we think, has given the only judicious solution of the difficulty by referring to a very common oriental species (*Gypaëtus barbatus*, Storr), which was remarked by Aristotle to be similar in form to the eagle, but had more the habits of the vulture.

Besides the nictitating membrane in the eye of birds already described, which is not altogether peculiar to them, there is another singular part of the organ whose use has not hitherto been clearly ascertained. It is called by the French Academicians the purse (*marsupium*), and the comb (*pecten plicatum*). It arises in the back of the eye, and proceeding, apparently, through a slit in the retina, it passes obliquely into the vitreous humour, where it terminates, reaching in some species to the capsule of the lens. Numerous bloodvessels run in the folds of the membranes which compose it, and the black pigment by which it is covered suggests

* Matt. xxiv., 28, and Luke xvii., 37.

the idea that it is chiefly destined to absorb the rays of light when they are too strong or dazzling; if this be the fact, it may serve the eagle in good stead when gazing, if he ever do so, on the sun. It is the opinion of others that it serves to assist in producing the internal changes of the eye; but this has been opposed by Crampton, who has shown that the changes in question, at least in the ostrich and several large birds, are produced by a peculiar circular muscle in the eyeball.

This singular membrane has been long known, and is well described by the French Academicians, who remark that, in the eyes of the turkey, the optic nerve, which is situated very near the side, spreads into a round space, from the circumference of which a number of black filaments are sent off to form, by their union, a membrane peculiar to the eye of birds. In the eyes of the ostrich they describe the optic nerve as dilated into a sort of funnel of a similar substance. From this funnel a folded membrane takes its origin, forming a sort of purse drawn to a point. This is covered with a black pigment easily rubbed off.

Buffon is of opinion, that on account of this expansion of the optic nerve, birds must have a vastly more perfect sight than other animals, embracing also a much wider range. Hence it is that a sparrow-hawk, while he hovers in the air, espies a lark sitting on a clod, though at twenty times the distance at which it could be perceived by a man or dog. The kite, which soars to so amazing a height as totally to vanish from our sight, can yet distinguish small lizards, field-mice, and birds, and from this lofty station he selects his prey. This prodigious extent of vision is, moreover, conjoined with equal accuracy and clearness, inasmuch as the eye can dilate and contract; can be shaded or uncovered; depressed or protruded; readily assuming the precise condition adapted to the distance of an object and the quantity of light.

In consequence of the rapidity with which birds traverse the air, extent and acuteness of vision appear to be indispensable, in order to direct them in their flight. Had they, indeed, been formed with eyes like the mole (*Talpa lucida*, C. BONAPARTE), incapable of seeing more than a few inches' distance, they would have been in constant danger of dashing against every intervening obstacle. "Indeed," says Buffon, "we may consider the celerity with which an animal moves as a just indication of the perfection of its vision. A bird, for instance, that shoots swiftly through the air, must undoubtedly see better than one which slowly describes a tortuous tract. Among quadrupeds, again, the sloths have a very limited sight." It may accordingly be inferred, that birds have more precise ideas than slow-moving caterpillars, of motion and its accompanying circumstances, such as those of relative velocity, extent of country, the proportional height of eminences, and the various inequalities of hill and dale, mountain and valley.

The eye of birds, it is worthy of remark, besides being peculiar in structure, is also greatly larger than in most other animals in proportion to the bulk of the head.

The mere bulk of the eye, however, is rather a fallacious test to trust to; for several birds, in which the globe of the eye is large, have very weak sight, particularly in the daytime, such as the woodcock and the owls. The woodcock (*Scolopax Gallinago*, RAY) has very large, prominent eyes, but it cannot support a strong light, and sees best during twilight; and, as Colonel Montagu remarks, its eyes seem to be peculiarly calculated for collecting the faint rays of light in the darkened vales and sequestered woodlands during nocturnal excursions, thus enabling it to avoid trees and other obstacles. It is probable, indeed, that the proverbial stupidity of the bird arises from this weakness of sight.

Like the owl, indeed, its motions are much more agile and lively at nightfall and dawn than at any other time; and so strong is this propensity to action at the rise or descent of the sun, that woodcocks when kept in a room are observed to flutter about regularly every morning and evening, while during the day they only trip on the floor without attempting to fly.

The stone-curlew (*Œdicnemus crepitans*, Temminck) differs from the woodcock particularly in this, that though its eyes are similarly prominent, yet, if we may believe M. Montbeillard, its sight is very acute in the daytime, though he admits it can see best in the twilight. The prominence of its eyes enables it to see behind as well as before, and it is with difficulty, therefore, that it can be approached. Paley justly remarks, that "what is gained by the largeness or prominence of the globe of the eye is width in the field of vision."

With respect to owls, as well as most night-prowling animals, the eye is unquestionably very sensible. Of the barred owl (*Strix nebulosa*, Gmelin), Audubon says, its "power of sight during the day seems to be rather of an equivocal character, as I once saw one alight on the back of a cow, which it left so suddenly afterward, when the cow moved, as to prove to me that it had mistaken the object on which it had perched for something else. At other times I have observed that the approach of the gray squirrel intimidated them, if one of these animals accidentally jumped on a branch close to them, although the owl destroys a number of them during twilight." M. Vaillant mentions a similar circumstance which he more than once observed in different species of owls, if they chanced to be roused from their lurking-places by day, when, instead of pursuing small birds, which are their natural prey, they fled from them in fear.

Wilson says of the snowy owl (*Stryx nyctea*), that

"the conformation of the eye forms a curious and interesting subject to the young anatomist. The globe of the eye is immoveably fixed in its socket by a strong, elastic, hard cartilaginous case, in form of a truncated cone: this case, being closely covered with a skin, appears at first to be of one continued piece, but on removing the exterior membrane it is found to be formed of fifteen pieces, placed like the staves of a cask, overlapping a little at the base or narrow end, and seem as if capable of being enlarged or contracted, perhaps by the muscular membrane in which they are encased." "In five other different species of owls," adds Wilson, "which I have since examined, I found nearly the same conformation of this organ, and exactly the same number of staves. The eye being thus fixed, these birds, as they view different objects, are always obliged to turn the head, and nature has so excellently adapted their neck to this purpose, that they can with ease turn it round, without moving the body, in almost a complete circle."*

In nocturnal birds, M. de Blainville remarks, that the eye, besides being comparatively very large, is flat (*comprimé*) both before and behind, while the transparent cornea is placed at the end of a sort of tube formed by the bony portion of the sclerotic. The retina is, consequently, comparatively very large and extended, and the iris also, while the membranes, being probably more soft and delicate, are more susceptible of impressions from a small quantity of light. The nictitating membrane is also very large, and the upper eyelid, unlike other birds, is moveable.

It may be worth mentioning, that animals born with perfect eyes can use them the instant they enter the world. Sir James Hall, when making experiments on hatching, observed a chicken in the

* Amer. Ornith., iv., 56, 1st edit.

act of breaking through the shell, and just as it got out a spider began to run along the box, when the chicken darted forward, seized and swallowed it as adroitly as if it had been instructed by its mother.

CHAPTER XIX.

HEARING, SMELL, AND TASTE OF BIRDS.

The effect of an accidental occurrence in giving undue importance to things not otherwise extraordinary, is strikingly exemplified in the instance of the geese which are reported to have saved the capitol of Rome. "The Gauls," says Livy, "having discovered that the rock Carmentalis was accessible, one night when it was pretty clear, sent a man to examine the way, without his arms, which were afterward handed to him. Others followed, lifting and assisting each other, according to the difficulties they encountered in the ascent, till they reached the summit. They proceeded with so much silence, that neither the sentinels nor even the dogs, animals usually so vigilant as to be roused by the slightest noise, took any alarm. They did not, however, escape the notice of the geese, which, being sacred to Juno, had been fed by the Romans, notwithstanding the famine caused by the siege. This saved the capitol; for, by their cackling and beating their wings, they roused Marcus Manlius, a brave soldier and formerly consul, who, snatching up his arms and giving the alarm, flew to the ramparts, set upon the Gauls, and, by precipitating one of them over the rocks, terrified them so much that they threw down their arms."* Pliny accordingly infers from

* Hist., v., 47.

this circumstance (probably a mere legend), that "the goose is very vigilant and watchfull: witnesse the capitol of Rome, which by the meanes of geese was defended and saved; whereas at the same time, through the default of dogs (which should have given warning), all had like to have bin lost."* Ælian again tells us that the Gauls bribed the dogs of the capitol to silence with food, which the geese refused and screamed out; and hence it was inferred by Columella that geese are preferable to dogs for watching a farm, while Vegetius does not hesitate to assert that they are the most vigilant sentinels that can be planted in a besieged city.

Whatever truth may be in the narratives given by Livy and Ælian, we are quite certain that, so far from possessing any superiority either in hearing or smelling, the goose is much inferior to many other birds in these respects. This is easily proved by the simple experiment of trying the effect of various sounds upon the birds, taking care to have the cause thereof concealed from their view. We have, for example, caused a dog to bark behind a wall on the other side of which geese were feeding, without their appearing to take any notice of it, any more than they did when we shouted aloud on purpose to alarm them. When the dog, however, was brought into view, they took immediate alarm.

The correct view of the matter, as it appears to us, was first hinted at by Albertus Magnus, who says the goose sleeps so lightly that it is awakened by the least noise. The profoundness of sleep, indeed, is found to be in proportion to the quantity of brain and the rapidity of circulation, and both these being in birds unfavourable to sleep, renders them very easily awakened. The hearing, also, according to M. Cabani, though it is not so soon overpowered by sleep as sight, smell, and taste, is much more easily

* Hist. Nat., x., 22, by Holland.

awakened, for a slight noise will often rouse a sleep-walker, who had borne an intense light on his unshut eyes without seeming in the least to feel its influence.

The structure of the ear in birds would lead us to conclude that they could not hear so quickly as other animals. Nevertheless, we find that the sense of hearing is enjoyed in an exquisite degree in birds; that the organ of the sense is not imperfect, but is adapted to a new construction, and a varied apparatus suited to the condition of the bird; and that there is no accidental dislocation or substitution of something less perfect than what we find in other classes of animals."*

The internal parts of the ear in birds are much less complicated than in man and quadrupeds; but, without going into the minute particulars of difference, we shall only mention one peculiarity, which is, that while the chamber of the drum communicates with three large cavities in the adjacent bony plates, these again communicate by an equal number of openings with the drum in the same side, one of them extending over the scull to its fellow on the other side. Sir Everard Home has observed a similar kind of communication by means of the cells of the scull in the elephant. We have little doubt that the provision made for rendering birds more buoyant, consisting of air-vessels extended from the lungs throughout the body, and even to the bones themselves, contributes to render the vibrations of the air more distinct, muffled as they must always partially be by the feathers of the bird.

The faculty of imitating sounds possessed by certain birds, proves that their hearing must be exceedingly delicate; and though we suspend our belief of the great musical talents which some birds are said to have derived from education, we find

* Bridgewater Treatise on the Hand, p. 139.

many well-attested instances of a delicate ear in species by no means remarkable for vocal execution. Madame Piozzi gives an account of a tame pigeon, which answered by gesticulation to every note of a harpsichord. As often as she began to play, the pigeon hurried to the concert with every indication of rapturous delight. A false note produced in the bird evident tokens of displeasure, and, if frequently repeated, it lost all temper and tore her hands.*

A no less remarkable instance of the effect of music on a pigeon is related by Lockman in his reflections upon operas, prefixed to his musical drama of Rosalinda. Being at the house of a Cheshire gentleman, whose daughter was a fine performer on the harpsichord, he observed a pigeon, which, whenever the young lady played the song of "*Speri si*" in Handell's opera of Admetus, would descend from an adjacent dovecot to the room window where she sat, and listen with every indication of pleasure till the song was finished, when it uniformly returned to the dovecot.

M. Le Cat, holding the theory that the cochlea or snail-shell of the ear is the organ which perceives harmony and which is wanting in birds, yet admits birds to be the most musical of all animals, and to have an exquisite hearing, "because," he says, "their heads are almost entirely sonorous like a bell, owing to their not being involved in complicated muscles, as are the heads of other animals. Hence must they necessarily be agitated by the sounds which present themselves. The labyrinth of their ear being very sonorous, is sufficient for this end. The most simple grot will echo back a musical air; but if, to this excellent disposition of hearing in birds, nature had added the cochlea, they would have been much more sensible of harmonious modulations. They would have had a passion for harmony, as almost

* Letters from France and Italy.

all animals have for gormandizing, which is not the case. For one ought to recollect that the musical quality peculiar to birds proceeds less from the delicacy and taste of their ear than from the disposition of their throat. They farthermore, in this particular, resemble musicians, who give pleasure to others without partaking of any themselves. We hear a dog howl, we see him weep, as it were, at a tune played upon a flute; when, on the contrary, this animal is all alive in the field at the sound of a French horn. The horse takes fire at the sound of a trumpet, in spite of the thick muscular texture his auditory organ is encompassed with. Without the cochlea these animals are provided with, one would by no means discover in them this sensibility for harmony. We should rather find them, in this respect, as stupid as fish, which are destitute of the cochlea as well as birds; but without the advantages which birds have, of a head sufficiently disengaged, sufficiently sonorous, to supply this defect."*

For the sake of illustration, we may remark that many other animals besides birds are observed to be singularly affected with certain sounds. Among these, the elephant is not a little remarkable, though Sir Everard Home is disposed to think it does not possess a musical ear. Suetonius, for example, tells us that the Emperor Domitian had a troop of elephants disciplined to dance to the sound of music, and that one of them who had been beaten for not having his lesson perfect, was observed, the night afterward, practising by himself in a meadow. Outrageous bulls have likewise, in several instances, been calmed into gentleness by music. Of this musical feeling in oxen Dr. Southey mentions a very singular instance. "The carts," he says, "of Corunna make so loud and disagreeable a creaking with their wheels for want of oil, that the governor

* Le Cat on the Senses, Eng. trans.

once issued an order to have them greased; but it was revoked on the petition of the carters, who stated that the oxen liked the sound, and would not draw without its music."* Even fish, upon better authority than the old story of Amphion and the dolphin, are said to have shown signs of being affected by music; and seals, we are told, have crowded to hear a violin.† "Seals," says Valerius Flaccus, "delight in song," which Sir Walter Scott has rendered,

> "Rude Heiskar's seals, through surges dark,
> Will long pursue the minstrel's bark."

In Germany they take the shad (*Alosa clupea*, Merret) by means of nets, to which bows of wood, hung with a number of little bells, are attached in such a manner as to chime in harmony when the nets are moved. The shad, when once attracted by the sound, will not attempt to escape while the bells continue to ring. Ælian says the shad is allured by castanets: and so delicate is the ear of this fish reported to be, that the sound of thunder terrifies them to death, and numbers are annually found thus killed on the Rhine and the Moselle.

Numerous other instances of a similar kind are recorded, upon authority far from being destitute of respectability, though they may somewhat startle the faith of the incredulous. An officer, confined in the Bastile at Paris, begged the governor to permit him the use of his lute, to soften his confinement by the harmonies of his instrument. At the end of a few days this modern Orpheus, playing on his lute, was greatly astonished to see frisking out of their holes great numbers of mice, and descending from their woven habitations crowds of spiders, which formed a circle about him while he contin-

* Letters from Spain.
† Laing's Voyage to Spitzbergen.

ued playing upon his instrument. At first he was petrified with astonishment, when, having ceased to play, the assembly of animals immediately broke up. Having a great dislike to vermin, it was two days before he ventured to touch the instrument; but having mustered courage to conquer his dislike, he recommenced his concert, when the assembly was by far more numerous than at first; and, in the course of farther time, he found himself surrounded by a hundred of these animal amateurs.

M. Marville has given the following curious details on this subject. Doubting, he tells us, the truth of those who say it is natural for us to love music, especially the sound of instruments, and that beasts themselves are touched with it, being one day in the country he made his observations, while a man was playing on a conch shell, upon a cat, a dog, a horse, an ass, a hind, cows, small birds, and some barndoor fowls in a yard under the window on which he was leaning. He did not perceive that the cat was in the least affected, and he even judged by her air that she would have given all the musical instruments in the world for a mouse, for she slept all the while unmoved in the sun; the horse stopped short from time to time before the window, raising his head up now and then, as he was feeding on the grass; the dog continued for above an hour seated on his hind legs, looking steadfastly at the player; and the ass did not discover the least indication of his being touched, eating his thistles very peaceably; the hind lifted up her large wide ears, and seemed very attentive; the cows slept a little, and after gazing a while went forward; some little birds which were in an aviary, and others on trees and bushes, almost tore their little throats with singing; but the cock minding his hens, and the hens solely employed in scraping in a neighbouring dunghill, did not show in any manner that they took the least pleasure in hearing the music.

Sir William Jones, in his curious dissertation on the musical modes of the Hindoos, says, "I have been assured by a credible eyewitness that two wild antelopes used often to come from their woods to the place where a more savage beast—Sirajuddaulah—entertained himself with concerts, and that they listened to the strains with an appearance of pleasure, till the monster, in whose soul there was no music, shot one of them to display his skill in archery."*

The anatomical structure and conformation which constitutes what is called a musical ear, remains hitherto unknown; but if we may judge from the songs of birds, it must differ considerably in them from what it does in man, as their musical scale cannot be adapted to any of ours; though Mrs. Piozzi's account of the musical pigeon, as well as the fact of bulfinches and other birds learning to pipe waltzes and other airs, proves that they can accommodate their ear to scales differing from the one in which they naturally sing.

Smell in Birds.—As the sensation of smell, so far as we can judge, seems to depend upon the diffusion in the air of very subtile effluvia, or a principle called *aroma*, hitherto but little understood, it is obvious that objects cannot be perceived at so great a distance by smell as by hearing or vision, which do not depend on materials derived from the objects themselves. The discovery of distant water by the camel, however, seems to depend on the sense of smell; and, if we are to credit the authorities given by Bryant, the ass has a similar faculty of discovering distant water by the smell.

These two instances of the camel and the ass, however, seem to be solitary, for we have no good evidence to prove that other animals can discover very distant objects by the smell, though the fact

* Asiatic Researches.

has been commonly asserted of vultures, and also of the goose. In a case of this sort, observation is always better than the most ingenious and plausible theoretical reasoning; and fortunately we possess, with respect to the vulture and some other birds, the remarks of Dr. James Johnson, which we have already partially referred to. "It has always," says the doctor, "appeared to us most extraordinary, indeed unaccountable, that birds of prey could scent carcasses at such a distance as they are said to do. We were led to skepticism on this subject some twenty years ago, while observing the concourse of birds of prey from every point of the horizon to a corpse floating down the river Ganges, and that during the northeast monsoon, when the wind blew steadily from one point of the compass for months in succession. It was extremely difficult to imagine that the effluvia from a putrefying body in the water could emanate in direct opposition to the current of air, and impinge on the olfactories of birds many miles distant. Such, however, were the *dicta* of natural history, and we could only submit to the general opinion. We have no doubt, now that we know the general opinion to be something wrong, that it was by means of the optic rather than the olfactory nerve, that these birds found out their quarry.

"It has been ascertained by direct experiments, that where any putrid carrion was enclosed in a basket, from which effluvia could freely emanate, but which concealed the offal from sight, it attracted no attention from vultures and other birds of prey till it was exposed to their view, when they immediately recognised their object, and others came rapidly from different quarters of the horizon, where they were invisible a few minutes before. This sudden appearance of birds of prey, from immense distances and in every direction, however the wind may blow, can only be accounted for by their

soaring to an altitude. In this situation, their prey on the ground is seen by them, however minute it may be, and their appearance is merely their descent from high regions of the atmosphere to within the scope of our optics."

With respect to the smell of vultures, Willoughby says, "they have an excellent sagacity of smelling above all other birds, so that they can perceive the savour of dead carcasses from far," to which Ray adds, "many miles off they say."* Some of the old authors, indeed, such as Thomas Aquinas, specify the distance at which a vulture can scent out a dead body to be five hundred miles, and Isidore alleges it is no matter even if the sea itself intervene.

It may well be disputed, however, that the smell of the vulture or any other bird extends to the distances alleged by these writers, for, as was long ago remarked by Cælius Rhodiginus, odorous effluvia cannot be distinguished at any considerable distance, as they are not only diluted by being diffused in the air, but may even be thereby wholly changed in their qualities. The observations of Avicenna are still more to the point. "I have," he says, "observed vultures wheeling about in the air, and, of course, their vision must be extensive, to enable them to see from a higher elevation than the highest mountains, since they can in such circumstances discern a piece of carrion in the plains below them. But if it is denied that colours can be perceived at such distances, much more ought the same to be affirmed of odours, whose power is weaker than that of colours."

From all these various facts, we think Dr. Johnson's remarks are decidedly the most plausible; and even those authors who speak in the most unhesitating manner of the powers of smell, furnish from their own accounts circumstances to prove

* Ornith., by Ray, p. 66.

their opinions doubtful. Wilson, for example, speaking of the turkey-vulture (*Cathartes aura*, Illiger), says, "These birds, unless when rising from the earth, seldom flap their wings, but sweep along in ogees, and dipping and rising lines, and move with great rapidity. They are often seen in companies, soaring at an immense height, particularly previous to a thunder-storm. Their wings are not spread horizontally, but form a slight angle with the body upward, the tips having an upward curve. Their sense of smelling is astonishingly exquisite, and they never fail to discover carrion, even when at the distance from it of several miles."* Their soaring in the air, whether during a thunder-storm or at any other time, must evidently be not for the purpose of smelling out, but for discovering by the eye some piece of carrion. The Abbé Clavigero's account of the black vulture (*Catharte urubu*, Vieillot) is precisely similar. "They fly so high," he says, "that although they are pretty large, they are lost to the sight; and especially before a hailstorm, they will be seen wheeling in vast numbers under the loftiest clouds, till they entirely disappear. They feed upon carrion, which they discover by the acuteness of their sight and smell, from the greatest height, and descend upon it with a majestic flight in a great spiral course."†

The raven is another of those birds which have been celebrated for discovering distant objects by the smell, which Bingley thinks "must be very acute; for in the coldest winter days, at Hudson's Bay, when every kind of effluvia is almost instantaneously destroyed by the frost, buffaloes and other beasts have been killed where not one of these birds was to be seen, but in a few hours scores of them have been found collected about the spot, to pick up the blood and offal."‡ Mr. Knapp is also disposed

* Amer. Ornith., ix., 98, first edit. † Hist. Mexico.
‡ Animal Biography, ii., 242.

either to refer this circumstance to smell, or to some mysterious sense inscrutable to human penetration. "Should an animal die," he says, "or a limb of fresh carrion be on the hooks in the tree, the hoarse croak of the raven is sure immediately to be heard calling his congeners to the banquet. We see it daily in its progress of inspection, or high in the air on a transit to other regions, hastening, we conjecture, to some distant prey. With the exception of the snipe, no bird seems more universally spread over the surface of our globe than the raven, inhabiting every zone, the hot, the temperate, the severe; feeding upon and removing noxious substances from the earth, of which it obtains intimation by means of a faculty we have little conception of. Sight it cannot be; and we know not of any fetor escaping from an animal previous to putrescence so subtile as to call these scavengers of nature from the extremity of one county to that of another: for it is manifest from the height which they preserve in their flight, and the haste they are making, that their departure has been from some far distant station, having a remote and urgent object in contemplation."*

Water-birds (*Natatores*, Illiger) might be supposed, from the considerable development of their nerves of smell, to have this sense very acute. The organs of smell in the goose, however, are considerably less developed than those of the duck. The petrels, we might infer, ought to possess an acute smell, as their nostrils are not only large, but different from other birds; they project distinctly from the beak, forming a singular-looking sort of nose, in some species, such as the pintado petrel (*Procellaria capensis*), nearly an inch long; in the giant peterel (*P. gigantea*, Gmelin) it is much more. As these birds do not fly so high in the air as vultures and ravens, and live upon dead fish and similar garbage,

* Journal of a Naturalist, p. 172, 3d edit.

these prominent nostrils are probably intended to render them

"Sagacious of their quarry from afar."

This opinion is rendered more probable from the very different structure of the nostrils in birds which feed on live fish. The pelicans, for example, have the cavity of the nostrils in general very small, and the marginal cartilage, as well as the opening in the bone, scarcely perceptible, even in the skeleton. The cormorant (*Carbo cormoranus*, MEYER), again, which is ranked in the same group (*Pelecanidæ*, LEACH), has the nostrils so small that De Blainville says it is with difficulty a very small slit can be distinguished at the base of the bill in the living birds, hence he designates them by the term *Cryptorhinia*. The same author describes in several species a sort of scale covering the nostrils like a lid, which must, we should imagine, diminish their power of smell by admitting only a minute portion of the air containing odoriferous particles. It is worthy of remark, that the kingfisher (*Alcedo*), though not a swimming bird like the pelicans and cormorants, has very small nostrils, with a cartilaginous lid; smell being, so far as we can judge, of inferior moment to them, inasmuch as they feed almost exclusively on live fish, which they must discover and pursue by the eye.

In ducks (*Anatidæ*, LEACH), many of whom seek their food among the mud at the bottom of standing water, the nerves of smell are greatly expanded, a fact which has been long known. "Flat-billed birds," says Mr. Clayton, "that grope for their meat, have three pairs of nerves that come into their bills, whereby they have that accuracy to distinguish what is proper for food and what to be rejected, by their taste, when they do not see it. This was most evident in a duck's bill and head; ducks having larger nerves that come into their bills than

geese or any other bird that I have seen; and, therefore, quaffer and grope out their meat the most. But then I discovered none of these nerves in round-billed birds. But since, in my anatomies in the country, in a rook, I first observed two nerves that came down between the eyes into the upper bill, but considerably smaller than any of the three pair of nerves in the bills of ducks, but larger than the nerves of any other round-billed birds. And it is remarkable that those birds, more than any other round-billed birds, seem to grope for their meat in cowdung."*

The facts thus proved by the structure of the organ are corroborated by the actions of the birds themselves. There can be little doubt indeed that animals may sometimes be deceived into eating what is unwholesome, or even poisonous. But this, it is probable, happens much more rarely in those endowed with acute smell than in others; for, according to the beautiful remark of Cicero, borrowed, it is highly probable, from the Greek philosophers, "the nostrils are providentially placed high, because odours have a tendency to rise, and are also near the mouth for the purpose of descriminating food and drink." Even very young ducks, accordingly, will reject from the mud in which they may be fishing such substances as they judge by smell to be unfit for food, while they will eagerly swallow a bit of biscuit which, for the sake of experiment, may be concealed among the mud; and they will as eagerly seize and swallow any animal garbage which they find in the same place, and which has just been rejected by their fellow-swimmers the swans, whose food is wholly vegetable.† Dr. Darwin was therefore in some degree right in the following remarks, though he evidently carries his principle to extremes which facts will not altogether justify.

* Phil. Trans., No. 206. † J. Rennie.

"The senses of smell and taste," says the doctor, "in many other animals, greatly excel those of mankind; for in civilized society, as our victuals are generally prepared by others, and are adulterated with salt, spice, oil, and empyreuma, we do not hesitate about eating whatever is set before us, and neglect to cultivate these senses; whereas other animals try every morsel by the smell before they take it into their mouths, and by the taste before they swallow it; and are led each to his proper nourishment by this organ of sense."*

The woodcock (*Scolopax rusticola*, CHARLET), which feeds upon earthworms, exhibits great dexterity in discovering them. "These birds," as Colonel Montagu says, "rambling through the dark, are directed by an exquisite sense of smelling to those places most likely to produce their natural sustenance, and by a still more exquisite sense of feeling in their long bill collecting their food. The eye is not called into use, for, like the mole, they actually feed below the surface; and, by the sensibility of the instrument which is thrust into the soft earth, not a worm can escape that is within reach. A woodcock in our menagerie," he adds, "very soon discovered and drew forth every worm in the ground, which was dug up to enable it to bore; and worms put into a large gardenpot, covered with earth five or six inches deep, are always cleared by the next morning without one being left. The enormous quantity of worms that these birds eat is scarcely credible; indeed, it would be the constant labour of one person to procure such food for two or three woodcocks."†

Taste in Birds.—We have tried numerous experiments upon soft-billed song-birds (*Sylvicolæ*, VIEILLOT), which are, in some measure, omnivorous, in order to discover whether or not they were guided

* Zoonomia, i., 195. † Ornith. Dict., p. 562, 2d edit.

by taste in their preference or rejection of certain articles. The black-cap (*Philomela atricapilla*), for instance, which is very fond of berries, will greedily devour those of the elder, the privet, the honeysuckle, and the ivy, as well as currants and grapes; but it will not touch the berries of the bitter-sweet (*Solanum dulcamara*) which a redbreast in the adjacent cage seemed to relish, while he rejected the privet berries. What appeared to be the most remarkable circumstance in these experiments was, that the berries are for the most part swallowed entire, without the bird breaking or bruising them with its bill. Now it is difficult for us to conceive that the berry could be tasted while it remains unbroken; at least our organs are too obtuse to distinguish tastes under such circumstances.*

The observations of Mr. Knapp upon these birds agree exactly with our own. "Our gardens," he says, "shrubberies, and orchards become their resort, seeking for the fruits usually produced in those places.

"All these fruit-eating birds seem to have a very discriminating taste, and a decided preference for the richest sorts, the sweetest variety of the gooseberry or the currant always being selected; and, when they are consumed, less saccharine dainties are submitted to: but the hedgeberry of the season our little foreign connoisseurs disdain to feed on, leaving it for the humbler-appetited natives; they are away to sunnier regions and more grateful food."†

With respect to insects and other small animals upon which the same birds also feed, they are equally nice in their preferences and rejections. We had a fauvette (*Philomela hortensis*), for example, which was exceedingly fond of spiders (*Phalangium opilio, Epeira diadema, &c.*), the largest of which it would contrive to swallow; but the black-cap, though it

* J. Rennie. † Journ. of a Naturalist, p. 232, 3d edit.

will devour flies of every sort, will not touch a spider, and while it will eat almost any smooth caterpillar (*Phlogophora meticulosa*, *Mamestra brassicæ*, *&c.*), it will not touch those of the cabbage butterfly (*Pontia brassicæ*), which the fauvette devoured with avidity. Neither of these birds again, nor the nightingale, will touch an earthworm, of which the redbreast is very fond. No bird will touch the caterpillar of the magpie moth.

These facts, and many more of a similar kind, which we could easily enumerate, fully authorize us, we think, to conclude, that some birds at least are endowed with the faculty of taste; though this is expressly or partially denied by certain authors distinguished for accuracy of observation, such as Colonel Montagu and M. Blumenbach, because in several species "the tongue is horny, stiff, not supplied with nerves, and, consequently, unfit for an organ of taste." But it does not follow, because the tongue in most other animals is the chief organ of taste, that birds with a horny tongue destitute of nerves cannot discriminate their food by taste, since other parts of the mouth may perform this office; an inference rendered more probable from the structure and texture of the mouth, and from what takes place in man and quadrupeds.

Now all birds possess a tongue, though in some species, such as the pelican (*Onocrotalus pelecanus*, Aldrovand), it is so very small that its very existence has been denied by several good observers; among whom, Willoughby says, "I could not see any tongue; but where the root of the tongue was fixed I observed certain perforate bodies:" and Ray adds, "neither could Faber, who saw this same bird afterward at Rome, find the tongue, though he searched diligently for it."* The gulls (*Laridæ*, Leach), and the cormorant (*Carbo carmoranus*, Mey-

* Ray's Willoughby, Ornith., p. 327.

ER), have, according to M. de Blainville, an exceedingly small tongue, smooth, slippery, without horny texture, and with no trace of papillæ." These birds, however, feed chiefly, if not exclusively, on live fish, the species of which require little discrimination, as no species, we believe, comes amiss to them. The tongue in the ostrich (*Struthio Camelus*, ARISTOTLE), however, which is an omnivorous bird, is also small. Baron Cuvier describes it as "short and rounded like a crescent;" and Vallisnieri, the celebrated Italian naturalist, says it is "very short, similar to that of fishes, smooth, slippery (*lubrica*), and without any appearance of papillæ, which, according to Malpighi, are the chief organs of taste; and indeed it heedlessly swallows pieces of wood, stones, ropes, bits of cloth, iron, glass, and the like, not seeming to feel any taste, but foolishly gulping them down."

We think, on the contrary, the *lubrica* of his own description would lead to the conclusion that the ostrich did possess taste, and that the shortness of the tongue corresponds with the short bill.

CHAPTER XX.

WALKING OF BIRDS.

BIRDS, particularly small birds, appear to be the most restless of all animals; a circumstance which might lead us to conclude that animals are restless in proportion to their diminutive size, were this not in opposition to many other facts. The bee, for example, is equally noted for industry and bustling activity with the ant, which is not one fourth of its size; nay, the large wood ant (*Formica rufa*) is

greatly more active than the very small black ant (*Ponera contracta*, LATREILLE).

There cannot, however, be a doubt that the wren and the tomtit are more active and restless than the bustard, the ostrich, or even the eagle; and the activity moreover of such small birds is not, like that of the gnat, confined to an hour or two, but continues almost uninterruptedly during sunlight, sleep being, it would appear, less necessary than it is to larger animals to restore vigour after exertions so long continued. Motion of some kind indeed seems as indispensable to life as food and air; and even the motions of animals, which may be primarily accounted for by referring to their exertions to procure subsistence, and shelter, and the like, must always, in a secondary point of view, give them beneficial exercise.

"All living creatures," says Pliny, "have one certaine manner of marching and going, according to their several kinds, unto which they keep, and alter not. Birds only vary their course, whether they go upon the ground or flie in the aire. Some walke their stations, as crows and choughs; others hop and skip, as sparrows and ousels: some run, as partridges, woodcocks, and snipes; others again cast out their feet before them, staulk and jet as they go, as storks and cranes."*

There is a British bird, the swift (*Cypselus murarius*, TEMMINCK), which has, at least in name (*Apus*, BELON; *Hirundo Apus*, LINNÆUS), been represented as destitute of feet; but though its legs are exceedingly short, the structure of its feet is admirably adapted to its economy. The shortness of the legs and the great length of the wings render it very difficult, if not impossible, for it to rise from an even surface, and, as if conscious of this inability, it is never seen to light on the ground; "but," as

* Holland's Plinie, x., 38.

Dr. Drummond well remarks, "there is no imperfection in this, for the air and not the ground is the bird's place of abode."* The peculiar conformation of the foot distinguishes the swift from the swallows, and, indeed, from all other known birds; for though some species have the power of turning one of their toes either before or behind, none but the swift can turn all the four toes of the foot forward. The least toe, also, which, following the analogy of other birds, should be the back one, consists only of a single bone, while the other three toes have only two bones each; a structure adapted to the habit of the bird of clinging with ease to the perpendicular face of walls, and rocks, and eaves of houses, aided by its strong, sharp, hooked claws. Even when the swift is placed upon the ground it cannot walk, according to White, but only crawl.†

The feet in swallows, though not quite so short as in the swift, are very small, because its prescribed habits do not require them to be large. In the capture of its prey, for example, it does not employ its feet, and, to use the words of Dr. Drummond, it does not require them to be in any particular position, "as in water-birds, since it neither dives nor swims, it does not want long legs like the heron, for it has not to obtain its food by wading and patiently watching for it; neither has it occasion for the strong and powerful feet and claws of the bird of prey, because it needs no instruments for grasping. In fact, the great requisite in the foot of the swallow is, that it shall be formed without those qualifications which are such wise provisions in the feet of most other birds, for what is a perfection in them would be an imperfection in it. Its legs are extremely short, and the whole foot disproportionately small and delicate: this forms the perfection of the swallow's foot; and in it we may recognise

* Letters to a Young Naturalist, p. 218.
† Selborne, Lett. 61.

another of those admirable examples of Divine ordinance, which are everywhere before our eyes, without our taking the trouble of employing a thought on the subject."*

M. Montbeillard says of one species of the dipper (*Cat-marin*), that it can only walk on the surface of the waves, and his intelligent correspondent M. Baillon, of Montreuïl, says he one day found two of these divers cast ashore by the tide, lying on the sand, working their feet and wings, and crawling with difficulty, so that he gathered them like stones, though they were not hurt nor weakly; for upon throwing up one of them, it flew away, and dived, and played on the water, as if rejoiced at regaining its proper element.

The coot (*Fulica atra*), like the divers, has an aversion to take wing, and can seldom be sprung in its retreat at low water; yet though it walks rather awkwardly, it contrives to skulk through the grass and reeds with considerable quickness, the compressed form of its body being peculiarly fitted for this purpose; and we have often marked its progress by the top of the herbage, on the edge of a lake, moving as if it had been swept by a narrow current of wind. The same aversion to run rather than to take wing may also be remarked in the rails (*Rallidæ*, Leach), some of which are landbirds, and among these we may mention the landrail or corncrake (*Ortygometra crex*, Fleming), a bird that has been said never to take the water, and keeps regularly upon the ground, taking flight but rarely, and never except when compelled thereto.

"We may know," says M. Montbeillard, "when a dog lights on the scent of the corncrake from his keen search, his number of false tracks, and the obstinacy with which the bird persists in keeping the ground, insomuch that it may be sometimes

* Letters, p. 217.

caught by the hand; it often stops short and squats down; the dog, pushing eagerly forward, overshoots the spot, and loses the trace; the bird, it is said, profits by its blunder, and runs back on its path; nor does it spring till driven to the last extremity, and then it rises to a good height before it stretches onward. It flies heavily, and never to a great distance. It is usually seen to alight, but in vain should we search for it; before the fowler has reached the spot, the bird has tripped off more than a hundred paces. The fleetness of its feet compensates for the tardiness of its wings: all its little excursions, its windings, and its doublings in the field and meadows, are performed by running."*

The bird, however, most celebrated for fleetness of running is the ostrich, or bird-camel (*Struthio Camelus*), as it may well be named. "What time she lifteth up herself on high," says Job, "she scorneth the horse and his rider."† According to Dr. Shaw, the wings serve her both for sails and oars, while her feet, which have only two toes, and are not unlike the camel's, can bear great fatigue. M. Montbeillard, however, is of opinion that it does not spread its wings and tail-feathers with the view of assisting its motion, but from the common effect of the corresponding muscles, as a man in swimming throws out his arms. Though the ostrich is universally admitted to run faster than the fleetest horse, yet the Arabs contrive to run these birds down on horseback, their feathers being valuable, and their flesh not to be despised. The best and fleetest horses are trained for this chase. When the hunter has started his game, he puts his horse upon a gentle gallop, so as to keep the ostrich in sight, without coming too near to alarm it and put it to its full speed. Upon observing itself pursued, therefore, it begins to run at first but gently,

* Oiseaux, Art. Le Rale de Genet.
† Job xxxiv., 18.

Ostrich carrying a Negro.

its wings, like two arms, keeping alternate motion with its feet. It seldom runs in a direct line, but, like the hare, doubles, or, rather, courses in a circular manner, while the hunters, taking the diameter or tracing a smaller circle, meet the bird at unexpected turns, and with less fatigue to the horses. This chase is often continued for a day or two, when the poor ostrich is starved out and exhausted, and, finding all power of escape impossible, it endeavours to hide itself from the enemies it cannot avoid, running into some thicket, or burying its head in the sand; the hunters then rush in at full speed, leading as much as possible against the wind, and kill the bird with clubs, lest the feathers should be soiled with blood.

M. Adanson saw two tame ostriches which had been kept two years at the factory of Podor, on the south bank of the Niger. "They were so tame," he says, "that two little blacks mounted both together on the back of the largest: no sooner did he feel their weight than he began to run as fast as ever he could, till he carried them several times round the village, and it was impossible to stop him otherwise than by obstructing the passage. This sight pleased me so well that I would have it repeated, and, to try their strength, I made a full-grown negro mount the smallest and two others the largest. This burden did not seem to me at all disproportioned to their strength. At first they went a moderate gallop; when they were heated a little they expanded their wings as if it were to catch the wind, and they moved with such fleetness that they seemed to be off the ground. Everybody must some time or other have seen a partridge run, consequently must know there is no man whatever able to keep up with it, and it is easy to imagine that if this bird had a longer step its speed would be considerably augmented. The ostrich moves like the partridge, with both these advanta-

ges, and I am satisfied that those I am speaking of would have distanced the fleetest racehorses that were ever bred in England. It is true they would not hold out so long as a horse, but, without all doubt, they would be able to perform the race in less time. I have frequently beheld this sight, which is capable of giving one an idea of the prodigious strength of an ostrich, and of showing what use it might be of had we but the method of breaking it and managing it as we do a horse."*

The traveller, Moore, mentions that he saw a man journeying mounted upon an ostrich, though both this and the instance given by M. Adanson show the circumstance to be of unusual occurrence.

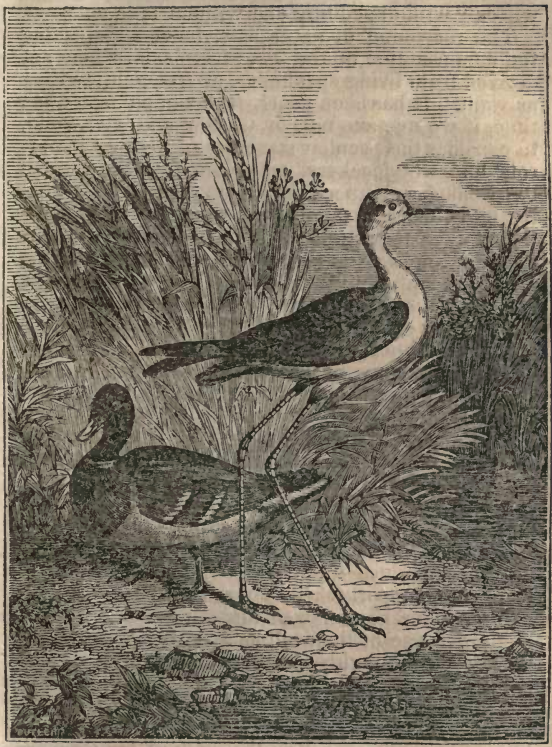
The bustard (*Otis tarda*, RAY) is very similar to the ostrich in its faculty of running, being so fleet as to be hunted with greyhounds, a sport followed even by the ancient Greeks, as we learn from Xenophon and Ælian. The male of this species is furnished with a singular bag or pouch, opening under the tongue, and hanging down on the forepart of the gullet as low as the middle of the neck. This seems to have been first observed by Aristotle, but was particularly described by Dr. Douglas, who imagined it was intended as a reservoir for water, indispensable in the extensive arid plains which it inhabits. He found it capacious enough to hold several quarts of water. Colonel Montagu, however, seems to be somewhat skeptical upon this point. "We think it impossible," he says, "the bird could fly with such an addition of weight before its wings which would throw it out of the centre of gravity. We see the heron, and many other birds, obliged to extend their legs behind, and contract their necks when flying, in order to balance themselves on the wing." It would appear,

* Voyage to Senegal, Pinkerton's Collection, xvi., 69.

indeed, from the observations of Sir Everard Home, that Montagu's objections are valid, for in the adjutant (*Ciconia argala*, Temminck), which has a bag precisely similar, he found that it contained "nothing but air, which the bird has a power of expelling and filling the bag again at pleasure." In the adjutant the bag communicates with the large air-cells on the back of the neck, and therefore we may fairly conclude it is intended to render the birds light and buoyant for running, since they are too heavy to fly without considerable difficulty.

These birds are remarkable for the length of their legs, which must be very advantageous for swiftness of running; but it would be wrong to infer, as a general principle, that all birds with long legs are swiftfooted. On the contrary, the wading birds (*Grallatores*, Illiger), which have proportionably much longer legs than the ostrich or the bustard, are not well adapted for walking on land. Among these the flamingo (*Phœnicopterus rubur*) is one of the longest-legged birds, yet it is in this respect far exceeded by the stilt (*Himantopus melanopterus*, Meyer), and the legs in the latter are, besides, slender and even, "so flexible," as Wilson says of the American stilt, "that they may be bent considerably without danger of breaking."* Aldrovand mentions its pace as slow and laborious, and White of Selborne says, "it must be matter of great curiosity to see it move, to observe how it can wield such a length of lever with such feeble muscles as the thighs seem to be furnished with. At best one should expect it to be but a bad walker; but what adds to the wonder is, that it has no back toe. Now, without that steady prop to support its steps, it must be liable in speculation to perpetual vacillations, and seldom able to preserve the true centre of gravity."† The truth is, that the legs are not formed for walking, but for wading; and we have

* Amer. Ornith., vii., 55. † Letter 91.



Himantopus melanopterus—The Stilt. (A duck has been introduced to show by comparison the great length of the stilt's legs.)

the testimony of Wilson that the American species wades "with expedition and without fatigue."*

The reasoning of naturalists, indeed, respecting the conformation of the feet of birds is, when not derived from living specimens, as frequently wrong as right. It has been usual, for example, since the time, if we mistake not, of Gesner and Aldrovand, to consider the peculiar structure of the foot in parrots and woodpeckers, with two toes before and two behind, as so peculiarly characteristic of climbing birds, that in systematic classifications the birds which have their toes so placed are denominated climbing birds (*Scansores*, Illiger; *Grimpeurs*, Lacepede). But, unfortunately for this division, many species which have the feet so constructed have never been observed to climb, such as the cuckoo and the wryneck, while many species which do climb, such as the nuthatch (*Sitta*) and the creeper (*Certhia*), have their toes placed in the usual manner.

White's remarks on the walk of birds are well worth quoting. "Most small birds," he says, "hop; but wagtails and larks walk, moving their legs alternately; all the duck kind waddle; divers and auks walk as if fettered, and stand erect on their tails; crows and daws swagger in their walk; woodpeckers use their tails, which incline downward, as a support when they run up trees; parrots, like all other hookclawed birds, walk awkwardly, and make use of their bill as a third foot, climbing and descending with ridiculous caution. All the poultry (*Gallinæ*) parade and walk gracefully and run nimbly."†

One of the most singular circumstances which we have met with respecting the walk of birds occurs in the Chinese jacana (*Parra sinensis*, Latham), whose enormously long toes enable it to walk with agility from leaf to leaf of the great water-lily.

* Amer. Ornith., vii., 55. † Selborne, Letter 84.

The Jacana (*Parra sinensis*) walking on the floating leaves of the water-lily.

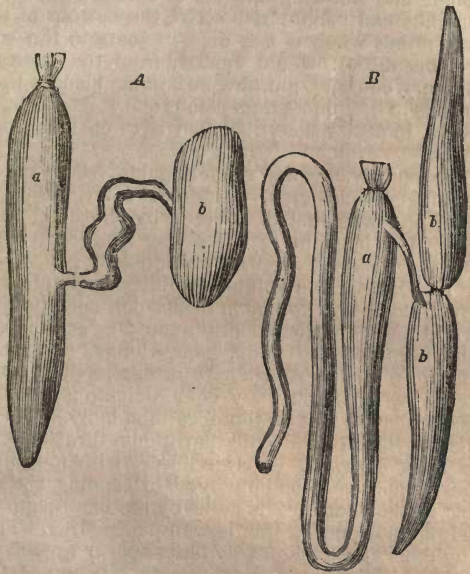
CHAPTER XXI.

FLIGHT OF BIRDS.

The flying of a bird in the air is performed on similar principles to that of a fish swimming in the water, with this difference, that the bird is more heavy, in comparison with the air, than the fish in comparison with the water. At first view, it might be thought impossible for so huge an animal as the Ostend whale (*Balænoptera boops?*), weighing four hundred and eighty thousand pounds, to swim in the sea, considering that its body, so far as the bones and muscles were concerned, must have been considerably heavier than water. Yet, by a singular contrivance, it is at once buoyed up in the sea, and rendered so much lighter than water, that it floats on the surface when dead. This consists in an enormous layer of an oily substance called blubber, immediately under the skin. We are well justified in using the epithet "enormous," from the fact that in the Ostend whale the blubber measured four thousand gallons, and weighed a twelfth of the whole body. With a large proportion, therefore, of a light body like this to buoy it up, so far from finding it difficult to swim, it would require a great effort in order to dive deep into the water.

In fishes (for the whale, being a warm-blooded animal, and breathing the air, is not considered a fish), the buoyancy indispensable for swimming is effected by a very different contrivance. A bladder, varying in form in different species, is filled with air (azote in fresh water, and carbonic acid gas in marine, fishes), over which the animal appears to possess a voluntary power, either to empty it by

compression or fill it by distension. Now it is obvious that, by the effort to compress the swimming-bladder, the body of the fish must be contracted, and, consequently, as the absolute weight may be



Swimming-Bladders.—*A*, In the Dace: *a*, the stomach; *b*, the swimming-bladder.—*B*, In the Conger Eel: *a*, the stomach; *b b*, the swimming-bladder.

considered the same, or, as the mathematicians say, a constant quantity, the specific gravity, upon which the buoyancy depends, must increase, and the fish must accordingly sink. On the other hand, by the effort to distend the swimming-bladder, the muscles

are relaxed, and the whole body not only becomes specifically lighter, but the included air expands, and buoys up the fish. The truth of this explanation has been tried by the experiment of pricking the bladder and allowing the air to escape, when the fish sinks and cannot rise above the bottom of the water;* but when a fish dies it floats to the surface, because it would appear, from the want of voluntary compression, the swimming-bladder then expands to its utmost dimensions; at least we have always, in dead fishes, observed it to be much distended.

The contrivance for rendering birds buoyant in the air is considerably different from either of these, and was first discovered by the celebrated Harvey; at least, he says, he does "not remember it to have been previously observed by anybody." Air in considerable volume is introduced into the body, though it is not, as in fishes, contained in one cavity, but is distributed into numerous cells in various parts of the body. The lungs, compared with those of quadrupeds, are rather small, but the aircells with which they communicate occupy a considerable extent of the chest and belly. These cells are much divided by partitions, furnished, as has been observed in large birds, with muscular fibres, supposed to be employed in sending the air back to the lungs, as is done by the diaphragm in other animals, and which is wanting in birds. This is no doubt the reason why birds appear to pant so much in breathing, a much greater portion of the body being always put in motion than in quadrupeds.

Besides these aircells, which fill the whole cavity of the body from the neck downward, and serve the double purpose of assisting in the assimilation of nutriment by the supply of oxygen and the remo-

* Ray in Phil. Trans., No. 114–15.

val of carbon, and of diminishing the weight of the body, there are others situated in the bones themselves, particularly the larger bones, both those which are cylindrical and those which are broad and angular. It is not a little remarkable that all these bones in birds are (at least in the middle) destitute of marrow; and, as Camper has shown, are furnished with openings for the purpose of communicating with the lungs. Experienced observers can tell, from inspecting the bone of a full-grown bird, whether or not it contains aircells, without even seeing any of the openings through which the air enters, for such bones are, for the most part, of a purer white, and sometimes the bone is so thin that the cells may be seen through it; yet such appearances are not always to be trusted. The openings ought, therefore, in these investigations, to be sought for, though they are sometimes not a little difficult to discover. In the long bones, we may mention, they are generally situated close to one of the extremities, while in bones in pairs there is, for the most part, only one common opening.

"The airbones in young birds" are described to be "filled with marrow, which becomes gradually absorbed to make room for the admission of air. This gradual expansion of the aircells and absorption of the marrow can nowhere be observed so well as in the young tame geese, when killed in different periods of the autumn and winter. The limits to the aircells may be clearly seen from without by the transparency of the bony walls. From week to week the aircells increase in size, till, towards the close of the season, the airbones become transparent. In all these bones the marrow first disappears from the vicinity of the opening which admits the air, and continues longest at the points farther removed from this opening. Towards the close of the summer and beginning of au-

tumn, although in external appearance the young goose resembles the parent, no trace of aircells can be discovered in its bones, the interior of the bones being then filled with marrow. About the fifth or sixth month the marrow begins to disappear. This circumstance, which applies also to other birds, shows with what caution one should form an opinion, from young birds only, on the size of the aircells. In many kinds of birds the aircells of some bones are nearly fully developed, although they have the openings of the bones which lead to the aircells."*

Not only the bones, but the quills of the feathers also make a part of this contrivance. These, while growing, are filled with an organized pulp; but as soon as they arrive at their full growth, this pulp, being absorbed, renders them light, and the lightness is increased by air from the atmosphere being introduced into their cavity through a small opening at the termination of the furrow where the quill or barrel ends and the plumelets of the feather begin. Air is also introduced in a similar manner into the plumelets themselves.

"In a journey," says M. Tachard, "which we made to the loadstone mine, M. de la Marre wounded one of these large birds which our people call *Grand Gosier*, and the Siamese *Noktho* . . . . Its spread wings measured seven feet and a half. On dissection we found, under the fleshy panicles, very delicate membranes, which enveloped the whole body, which, folding differently, formed many considerable pouches, particularly between the thighs and the belly; between the wings and the ribs, and under the craw, some were so wide as to admit the two fingers; these great pouches divided into many little ducts, which, by perpetual subdivision, ran into an endless multitude of ramifications, which were

* Blumenbach, Comp. Anat., § 182.

perceptible only by the bubbles of air which inflated them; insomuch that, pressing the body of this bird, one heard a little noise like that produced by pressing the membranous parts of an animal which has been inflated. By the assistance of the probe and blowing, we discovered the communication of these membranes with the lungs."*

Besides the aircells filled from the lungs, there are others filled directly from the mouth and nostrils through the windpipe. The latter, particularly in birds of prey and high-flying birds (*Alauda*, *Ciconia*, *&c.*), are very large, ascending beneath the skin of the neck and shoulders and around the scull. "In the stork," says Doctor Macartney, "we find these cells large enough to admit the finger to pass a considerable way down upon the inside and back of the wing: they are also large in the owl."†

It is evident that all this extraordinary number and volume of aircells, as well as the very great strength observable in the bones of birds, is for the express purpose of rendering them light and buoyant, so that they may support themselves in the air with less effort.

The following excellent remarks on the structure, which is so admirably adapted for rendering birds light and buoyant, are by Sir Charles Bell:

"First," he says, "it is necessary that birds, as they are buoyed in the air, be specifically lighter; secondly, the circumference of their thorax must be extended, and the motions of their ribs limited, that the muscles of the wings may have sufficient space and firmness for their attachment. Both these objects are attained by a modification of the apparatus of breathing. The lungs are highly vascular and spongy, but they are not distended with air. The air is drawn through their substance into the large

* Hist. Géner. des Voyages, ix., 311.
† Rees' Cyclopædia, Art. Birds.

cavity common to the chest and abdomen; while the great office of decarbonization of the blood is securely performed, advantage is taken to let the air into all the cavities, even into those of the bones.

"The weight of the body being a necessary concomitant of muscular strength, we see why birds, by reason of their lightness, as well as by the conformation of their skeleton, walk badly. And, on the other hand, in observing how this lightness is adapted for flight, it is remarkable how small an addition to their body will prevent them rising on the wing. If the griffin-vulture be frightened after his repast, he must disgorge before he flies; and the condor, in the same circumstances, is taken by the Indians, like a quadruped, by throwing the lasso over it. It is interesting to notice the relations of great functions in the animal economy: birds are oviparous, because they never could have risen on the wing had they been viviparous; if the full stomach of a carnivorous bird retard its flight, we perceive that it could not have carried its young. The light body, the quill-feathers, the bill, and the laying of eggs, are all necessarily connected.

"As every one must have observed, the breast-bone of birds extends the whole length of the body; and owing to this extension, a lesser degree of motion suffices to respiration; so that a greater surface, necessary for the lodgment and attachment of the muscles of the wings, is obtained, while that surface is less disturbed by the action of breathing, and is more steady. Another peculiarity of the skeleton of the bird is the consolidation of the vertebræ of the back; a proof, if any were now necessary, that the whole system of bones conforms to that of the extremities, the firmer texture of the bones of the trunk being a part of the provision for the attachment of the muscles of the wings. The ostrich and cassowary, which are rather runners than fliers, have the spine loose.

"The vertebræ of the back being fixed in birds, and the pelvis reaching high, there is no motion in the body; indeed, if there were, it would be interrupted by the sternum. We cannot but admire, therefore, the composition of the neck and head, and how the extension of the vertebræ, and the length and pliability of the neck, while they give to the bill the office of a hand, become a substitution for the loss of motion in the body, by balancing the whole, as in standing, running, or flying. Is it not curious to observe how the whole skeleton is adapted to this one object, the power of the wings?

"While the ostrich has no keel in its breastbone, birds of passage are, on dissection, recognisable by the depth of this ridge of the sternum. The reason is, that the angle formed by this process, and the body of the bone, affords lodgment for the pectoral muscle, the powerful muscle of the wing. In this sketch of the dissection of the swallow, there is a curious resemblance to the human arm; and we cannot fail to observe, that the pectoral muscle constitutes the greater part of the bulk of the body. Borelli makes the pectoral muscles of a bird exceed in weight all the other muscles taken together, while the pectoral muscles of man are but a seventieth part of the whole mass of the muscles. And here we see the correspondence between the strength of this muscle and the rate of flying of the swallow, which is a mile in a minute, for ten hours every day, or six hundred miles a day. Mr. White says truly, that the swift lives on the wing; it eats, drinks, and collects materials for its nest in flying, and never rests but during darkness. If it be true that birds, when migrating, require a wind that blows against them, it implies an extraordinary power as well as continuance of muscular exertion.

"We see how Nature completes her work, when the intention is that the animal shall rise buoyant and powerful in the air: the whole texture of the

frame is altered and made light, in a manner consistent with strength. We see, also, how the mechanism of the anterior extremity is changed, and the muscles of the trunk differently directed."*

Though it is obvious that birds could not fly without wings, yet the peculiar mechanism of the process is not, we believe, generally understood. It is no uncommon thing to see a goose, while walking on the common, spread out its wings to their full extent, and begin to flap them about with great violence, and yet the bird is not thereby moved an inch from the ground; a circumstance that, without inquiry into the cause, seems contrary to what might have been anticipated. By observing the difference between this ground-flying (if we may call it so) of the goose, and the actual rising of a pheasant, for example, into the air, we may arrive at the reason why the goose does not, while the pheasant does, ascend. The goose, it may be remarked, keeps her wings spread both in the upward and the downward motion, and, consequently, the resistance of the air in the first case will press her body downward rather than upward; while, as her evident intention is not to rise above the ground, she forcibly expels the air from her aircells, as may be inferred from the screaming always uttered on those occasions, and caused, we have reason to believe, by the forcible expulsion of the air. Her body is thus rendered specifically heavier, and, consequently, resists the upward impulse given by the downward motion of the wings. The pheasant, on the other hand, instead of expelling the air, takes a deep inspiration, increasing the size of the body as much as possible, inflating at the same time the wing-feathers, and bulging them outward without separating their tips from the sides. While taking deep inspirations, he may be observed, also, several times

* Bridgewater Treatise on the Hand, p. 77.

rising on tiptoe, and puffing out and balancing his body, to feel whether he has thrown enough of air into the bones and feathers to float him along. He then crouches back in order to give additional force to his spring, and forthwith leaps up into the air, at the same time rapidly raising his wings from the sides, but keeping the individual feathers close together like a folded fan, which he takes care not to open till he begins to bring them down. For this purpose he spreads them out to their utmost extent, and then striking the air with all his force, its resistance pushes him upward, and he bounds aloft towards his tree-perch, or wherever else he wishes to go. The same series of motions, first raising the folded wings, and then forcibly bringing down the spread wings, must be incessantly repeated during the flight of every bird; in the same way a swimmer, by pressing the water downward with his spread hands, keeps himself afloat, and, by directing the motion obliquely backward, is thereby pushed forward. It may also be remarked, that the swimmer raises his hands before renewing the stroke with the fingers closed, slanting, in a similar way to the bird raising its folded wings, so as to diminish the surface opposed to the resisting medium. The direction in which a bird can fly depends greatly on the form of its wings; and hence Sir Everard Home justly infers, that a motion directly upward can only be performed by birds whose wings are nearly horizontal, as the lark and the quail. "In general," he says, "the wings are placed oblique: this is principally owing to the length of their feathers, the fixed point of which is at the root. When birds fly horizontally, their motion is not in a straight line, but obliquely upward, and they allow the body to come down to a lower level before a second stroke is made by the wings, so that they move in a succession of curves. To ascend obliquely, the wings must repeat their

strokes upon the air in quick succession; and in descending obliquely, these actions are proportionally slower.

"In birds of prey the form of the wings is very oblique, so that they cannot rise in the air perpendicularly unless they fly against the wind; they have, however, a greater power of horizontal motion than other birds, because the extreme parts of the wings are long, and the ends of the feathers lap over each other, which opposes a uniform resistance to the air; while in other birds the air passes through between the feathers, which lessens the power of keeping the wing oblique. To enable themselves to turn to the right or left, they move one wing more rapidly than the other. This is attended with difficulty when the flight is rapid; they therefore make a large sweep before they can turn round."*

In the ingenious attempts which have been made to devise wings to enable men to fly in the air, it has rarely been taken into account that the muscles of the most powerful arm are proportionably slender and weak when compared with the wing-muscles of birds; and, therefore, even if wings sufficiently efficient could be contrived, the arms would be too feeble to wield them, considering also that there are no aircells distributed through the human body as in birds, to diminish its specific gravity by inflation.

* Home, Comp. Anat., i., 8.

CHAPTER XXII.

MIGRATION OF BIRDS.

Few subjects connected with natural history are more interesting, or have more attracted the attention of ordinary observers, than the periodical appearance and disappearance of certain species of birds. These curious phenomena have been noticed in all ages and countries; the sages of old, as well as the scientific of our own days, have looked upon them with interest; and to the agriculturist, the shepherd, and all whose occupations lead them to the fields, the woods, or the hills, they are in some measure familiar. Even the inspired seer has found in them an illustration suited to his purpose: "The stork in the heaven," says the prophet Jeremiah, "knoweth her appointed times; and the turtle, and the crane, and the swallow observe the time of their coming."

The regular appearance and disappearance of some species of birds excited the curiosity of observers in all ages, and led to many conjectures respecting its causes. It was long alleged and believed that swallows, instead of removing to warmer climates, lie concealed in fissures of rocks, in sand-banks, in the holes of decayed trees, and even at the bottom of the water in ponds, remaining during the winter in a torpid state. "It is certain," says the Dutch naturalist Jonston, "that in hollow trees, lying many close together, they preserve themselves by mutual heat." "In certain woods of Upper Germany," says the author of the Physicæ Curiosæ, "upon cutting up a rotten oak-tree, it has been found full of swallows." He does not quote

his authority, but we find the same circumstance reported by Albertus Magnus, Gaspar Heldelin, Augustine Niphus, and others.

Unfortunately for the credibility of such accounts, however, they all wear the aspect of fanciful conjecture rather than of a fact actually observed; and though we have accounts of similar circumstances purporting to be from actual observation, they all appear suspicious when strictly investigated.

The following narrative by M. Achard was communicated to the Royal Society by Mr. Peter Collinson. "In the latter end of March," says he, "I took my passage down the Rhine to Rotterdam. A little below Basil, the south bank of the river was very high and steep, of a sandy soil, sixty or eighty feet above the water.

"I was surprised at seeing near the top of the cliff some boys tied to ropes, hanging down doing something. The singularity of these adventurous boys, and the business they so daringly attempted, made us stop our navigation to inquire into the meaning of it. The waterman told us they were reaching the holes in the cliffs for swallows or martins, which took refuge in them, and remained there all the winter, until warm weather, and then they came abroad. The boys being let down by their comrades to the holes, put in a long rammer, with a screw at the end, such as is used to unload guns, and, twisting it about, drew out the birds. For a trifle I procured some of them. When I first had them, they seemed stiff and lifeless; I put one of them in my bosom, between my skin and shirt, and laid another on a board, the sun shining full and warm upon it; and one or two of my companions did the like. That in my bosom revived in about a quarter of an hour; feeling it move, I took it out to look at it; but perceiving it not sufficiently come to itself, I put it in again: in about another quarter, feeling it flutter pretty briskly, I took it out and ad-

mired it. Being now perfectly recovered, before I was aware, it took flight; the covering of the boat prevented me seeing where it went. The bird on the board, though exposed to a full sun, yet I presume, from a chillness of the air, did not revive so as to be able to fly."*

White of Selborne was so much convinced of the probability of swallows remaining hid or torpid during winter, that he attempted to watch them to their retreat, and actually saw them dart down above some low shrubs for several evenings together.

The Rev. W. T. Bree, an excellent observer, who has for many years attended to the arrival and departure of swallows, seems to incline to a similar opinion with that of White. There can be no question, indeed, about the fact of some few swallows appearing early in April, and even in March, before the general flight arrive; a fact which is recorded in the proverb, that "one swallow does not make summer," common to most languages. This is a circumstance, according to these naturalists, "much more in favour of hiding than migration, since it is more probable that a bird should retire to its hybernaculum, just at hand, than return for a week or two only to warmer latitudes." After a review of all the facts bearing on the case, Mr. Bree concludes that, "however far they may fall short of positive proof, they undoubtedly afford much probability to White's opinion, that the *hirundines* do not all leave this island in winter."†

Spallanzani saw swallows in October on the island of Lipari, and he was told that when a warm southerly breeze blows in winter, they are frequently seen skimming along the streets. He thence comes to the same conclusion as the preceding, that they do not pass into Africa at the approach of win-

* Phil. Trans. for 1763. † Mag. Nat. His., ii, 17.

ter, but remain in the island, and issue from their retreat in warm days in quest of food.*

As the dormouse, the bat, and other hybernating animals do not appear to have any peculiarity of anatomical structure from which we might account for the circumstance, besides certain depositions of fat and a valvular conformation of the veins, the use of which is not well known, we cannot, consequently, make any inference upon this point from the anatomical structure of swallows and other migratory birds. But experiment is no less valuable a test than structure, and experiments respecting the conjectured torpidity of the swallow were tried by Spallanzani, who found that swallows do not appear to suffer by cold at the freezing point; while at eight or nine degrees below it they manifest uneasiness, and at thirteen or fourteen degrees below it they speedily perish. In order to discover the effect of a continued low temperature, Spallanzani confined some swallows in wicker cases covered with waxed silk to keep them dry, burying them in snow, with only a hole to admit air. After having been immersed for thirty-five hours, some of them were dead, and others exhibited signs of great weakness, but without any appearance of torpidity or even lethargy; in ten hours more they were all found dead. That they had not died in consequence of want of food, he further proved by keeping other swallows without food in his study, when he found they could support life from three to five days without anything to eat.

A still more convincing proof that swallows do not become torpid in winter, may be derived from those which have been successfully kept in cages. Dr. Reeve says he has known several attempts made to keep swallows in a warm room during winter without success; but M. Natterer kept a number of swallows in cages for eight or nine

* Travels in the Two Sicilies, iv., 115.

years together; and in this country they have been successfully reared by Mr. Pearson.

"Five or six of these birds," says Bewick, "were taken about the latter end of August, 1784, in a bat fowling-net at night; they were put separately into small cages, and fed with nightingale's food; in about a week or ten days they took food of themselves, and seemed much strengthened by it; they were then put all together into a deep cage, four feet long, with gravel at the bottom; a broad shallow pan was placed in it, in which they sometimes washed themselves. One day Mr. Pearson observed that they went into the water with unusual eagerness, hurrying in and out again repeatedly, with such swiftness as if they had been suddenly seized with a phrensy. Being anxious to see the result, he left them to themselves about half an hour, and going to the cage, found them all huddled together in a corner apparently dead; the cage was then placed at a proper distance from the fire, when only two of them recovered and were as healthy as before; the rest died. The two remaining were allowed to wash themselves occasionally for a short time only, but their feet soon after became swelled and inflamed, which Mr. Pearson attributed to their perching, and they died about Christmas; thus the first year's experiment was in some measure lost. Not discouraged by the failure of this, Mr. Pearson determined to make a second trial the succeeding year, from a strong desire of being convinced of the truth respecting their going into a state of torpidity. Accordingly, the next season, having taken some birds, he put them into the cage, and in every respect pursued the same method as with the last; but to guard their feet from the bad effects of the damp and cold, he covered the perches with flannel, and had the pleasure to observe that the birds throve extremely well; they sung their song through the winter, and soon after Christmas began to moult,

which they got through without any difficulty, and lived three or four years, regularly moulting every year at the usual time. On the renewal of their feathers, it appeared that their tails were forked exactly the same as in those birds which return hither in the spring, and in every respect their appearance was the same."*

The story of bank-swallows having been drawn from their holes on the Rhine, it may be observed, is dated in April, which is about the usual time of the appearance of those birds, and is no more extraordinary than it would be to find a sparrow under a house-eave, or a tomtit in the hole of a tree. Did the bank-swallows really remain torpid in those holes during the winter, nothing would be easier than to find them there; a circumstance which we believe has never been recorded even in the annals of credulity. In a numerous colony of this species, established in the bank of a stone-quarry at Catrine, in Ayreshire, we have in numerous instances witnessed the opening of the nestholes in the operations of quarrying, and never knew or heard of a swallow being found there either torpid or otherwise.

But however untenable the opinion may be that swallows and cuckoos become torpid in winter, it appears rational, when compared with the notion that has been gravely supported of their going under water to undergo their winter's sleep; a notion which we should not have brought under review were it not that it still seems to linger in the fancies of some, from the authority of the names of those by whom it has been adopted. The earliest statement of this notion which we have been able to trace is given by Olaus Magnus, archbishop of Upsal, in Sweden, published in 1555.

"From the northern waters," says the archbishop,

* British Birds, i., 324.

"swallows are often dragged up by fishermen in the form of clustered masses, mouth to mouth, wing to wing, and foot to foot, these having at the beginning of autumn collected among the reeds previous to submersion." Pennant shrewdly remarks that "the good archbishop did not want credulity;" for, "after having stocked the bottoms of lakes with birds, he stores the clouds with mice, which sometimes fall in plentiful showers in Norway and the neighbouring countries."

Etmuller, professor of Botany and Anatomy at Leipsic, a century after Olaus, gives his personal testimony to the circumstance. "I remember," he says, "to have found more than a bushel measure (*medimnus*) would hold of swallows closely clustered among the reeds of a fishpond under the ice, all of them to appearance dead, but the heart still pulsating."

Linnæus, taking the matter as proved, expressly says that "the chimney-swallow (*Hirundo rustica*), together with the window-swallow (*H. urbica*), demerges, and in spring emerges;" and we find from the dissertations read before the Academy of Upsal, that the submersion of swallows was received in Sweden as an acknowledged fact. The late Peter Collinson, in his correspondence with Linnæus, "repeatedly urged him to bring the matter to a decisive issue by proposing some questions, and pointing out an easy method of having them answered. As Linnæus did not take any notice of these questions for a long while, although he was strongly called upon at different times by his acute correspondent, we may fairly infer that he was unable to give any satisfactory answer; and his constant evasion of the experimental proofs is an indication of his being unprepared to support what he had asserted by anything more than the common authorities "*

* Reeves on Torpidity, p. 47

The most recent authority which we have met with upon the subject is that of Baron Cuvier, who asserts of the bank-swallow (*Hirundo riparia*, PLINY), as "well authenticated, that it falls into a lethargic state during winter, and even that it passes that season at the bottom of marshy waters." It would have been well if he had at least referred us to some of these authenticated accounts; for we have been unable to trace anything more satisfactory than what we have already mentioned.

We deem it unnecessary to enter at much length upon a refutation of these opinions, as it must be obvious that it is physiologically impossible for a swallow or any other bird to live many minutes, much less for months, under water. The frog and other amphibious animals which do hybernate under water have a peculiar formation of the heart which enables them to do so, and which is not thus formed in swallows. "Though entirely satisfied," says Pennant, "in our own mind of the impossibility of these relations, yet desirous of strengthening our opinion with some better authority, we applied to that able anatomist, Mr. John Hunter, who was so obliging to inform us that he had dissected many swallows, but found nothing in them different from other birds as to the organs of respiration. That all those animals which he had dissected of the class that sleep during winter, such as lizards, frogs, &c., had a very different conformation as to these organs. That all these animals, he believes, do breathe in their torpid state; and, as far as his experience reaches, he knows they do; and that therefore he esteems it a very wild opinion that terrestrial animals can remain any long time under water without drowning."*

Independently of the established principles of physiology, the matter has been experimentally

* Brit. Zool., ii., 253.

tried, and it has been found that swallows kept under water, with all due precautions, die in a few minutes. A window-swallow, which M. Montbeillard had in his study, escaped from the cage and fell into a pan of water, and it was only by the greatest care that he succeeded in restoring it to life: a few minutes' longer immersion would probably have rendered his efforts hopeless.

It may be added, that in Germany a reward of an equal weight in silver was publicly offered to any one who should produce swallows found under water; but, as Frisch informs us, nobody ever claimed the money.

A no less fanciful, but, as it appears to us, a more defensible opinion, was published in a scarce tract purporting to be written by "A Person of Learning and Piety," who maintained, with no little ingenuity, that our migratory birds retire to the moon. He thinks that they are about two months in passing thither, and that, after they are arrived above the lower regions of the air into the thin æther, they will have no occasion for food, as it will not be so apt to prey upon the spirits as our lower air. Even on our earth, he argues, bears will live upon their fat all the winter; and hence these birds, being very succulent and sanguine, may have their provisions laid up in their bodies for the voyage: or perhaps they are thrown into a state of somnolency by the motion arising from the mutual attraction of the earth and moon.

"Concerning the great distance," he adds, "between the moon and the earth, if any shall still remain unsatisfied, I leave only this to his consideration, whether there may not be some concrete bodies at much less distance than the moon, which may be the recess of these creatures, and serve for little else but their entertainment.

"Thus we see many rocky islands in the sea that are of no other manifest use than for seafowls to

rest and breed upon, and these are therefore commonly called Gulrocks. Now if there be such globules (or ethereal islands), they must be supposed of such magnitude only, and set off at such distance as their reflective light may not reach home to our earth (though perhaps they may serve to illuminate our atmosphere), else they would ere now have been discovered, and yet no farther off than these birds may conveniently arrive unto them in such time as may be most convenient to allow them. This I do suggest, because it is as hard for me to persuade myself that they come from any other part of this earth as it is to persuade another that they come from the moon; and, therefore, if the moon will not be allowed, some other place must be found out for them."*

This notion, extravagant as it appears to be, was discussed by the celebrated Ray and his correspondents; but, as might have been expected, it was decided by them that the moon is too far off to be reached by our migratory birds.

Dismissing these untenable conjectures, we shall now state a few facts proving the migration of birds to other countries.

In the Philosophical Transactions,† Catesby, who gave much attention to this subject, remarks, that, besides the migratory birds which remain and breed throughout the summer, there are others which arrive periodically at certain places, for the sake of some sort of grain or other food of which their own country may be supposed destitute. These birds, after a short stay, depart, and are not again seen until that time twelvemonth, at which time they return, and continue repeating their annual visits. Pursuing the subject, the same sensible naturalist,

* An Essay towards the probable Solution of this Question, Whence come the Stork, &c.; or where those Birds do probably make their Recess, &c., 12mo., Crouch, London, 1703.

† Vol. xliv., part i., for the year 1746.

whose remarks on the general subject of migration subsequent writers have done little more than repeat, says, "though the secret ways by which instinct guides birds and other irrational creatures are little known to us, yet the causes of some of their actions are apparent. Analogous to the lucrative searches of man through distant regions, birds take distant flights in quest of food, or what else is agreeable to their nature; and, when they discover some new grain or pleasing food, they return, and acquaint their community therewith, and, joining in numerous flights, make annual excursions to solace in this their exotic food. Since the discovery of America, there have been introduced from Europe several sorts of grain which were never before known in that part of the world, and which, not before some length of time, were found out and coveted by these migratory birds. No wonder this grain should not be immediately known to birds of distant regions; for above half a century passed from the time of cultivating wheat, rice, and barley in Virginia and Carolina, before those grains were found out and frequented by those foreign birds, of which one has but lately made its appearance in Virginia, as my ingenious friend, Dr. Mitchel, informs me that he, being in his garden, a bird flew over his head, which appeared with uncommon lustre, and surprised him the more, not having seen the like kind before. Mentioning this to some of his neighbours, he was told by them, what afterward was confirmed to him by his own observation, that these exotic birds had but within these few years appeared in Virginia, and had never been observed there before. They arrive annually at the time that wheat (the fields of which they most frequent) is at a certain degree of maturity, and have constantly, every year from their first appearance, arrived about the same time in numerous flights. They have attained the name of wheatbirds." Catesby

further mentions that, in September, 1725, he was lying upon the deck of a sloop in a bay at Andros island, where he and the company with him distinctly heard, for three successive nights, the flight of these birds, whose note is plainly distinguishable from others, passing over head northerly, which is their direct way from Cuba to Carolina. This led him to conclude that, after partaking of the earlier crop of rice in Cuba, they proceed over the sea to Carolina with the same object, the rice being there ready for them.

The same writer speaks of the bluewing teal, a bird which, in the month of August, comes in great numbers to Carolina, and remains until the rice, on which they feed, is gathered in, in the month of October. In Virginia, where no rice grew, they fed on a kind of wild oat, growing in the marshes, and in both instances became extremely fat.

The same observant naturalist, in his fine work on the natural history of Carolina, Florida, and the Bahama Islands, gives an account of a migratory bird, which he calls the ricebird. The following is an abridgment of his account: In the beginning of September, while the grain of rice is yet soft and milky, innumerable flights of these birds arrive from some remote parts, to the great detriment of the inhabitants. In the year 1740, an inhabitant near Ashley River had forty acres of rice so devoured by them that he was in doubt whether the quantity they had left was worth the expense of gathering in. They are in Carolina esteemed more delicate eating than any other bird. When they first arrive they are lean, but become in a few days so excessively fat, that they fly sluggishly and with difficulty, and, when shot, frequently break with the fall: they continue three weeks, and retire by the time that the rice begins to harden. He mentions it as a very singular circumstance, that the henbird alone comes in the September visit. Seeing them to be

all feathered alike, he at first imagined that they were the young of both sexes not perfected in their colours; but by opening several scores, as they were prepared for the spit, he found them to be all females; and, after repeated searches, he was never able to find one cockbird at that time of the year. But in the spring of the year, another transient visit was paid, and then the different sexes were plainly distinguishable.

A remarkable example of this kind of migration is afforded by the passenger-pigeon of America, the history of which is given by Audubon, in his Ornithological Biography. "The most important facts," he says, "connected with its habits, relate to its migrations. These are entirely owing to the necessity of procuring food, and are not performed with the view of escaping the severity of a northern latitude, or of seeking a southern one for the purpose of breeding. They consequently do not take place at any fixed period or season of the year; indeed, it sometimes happens, that a continuance of a sufficient supply of food in one district will keep these birds absent from another for years. I know, at least, to a certainty, that in Kentucky they remained for several years constantly, and were nowhere else to be found. They all suddenly disappeared one season when the maize was exhausted, and did not return for a long period. Similar facts have been observed in other states.

"In the autumn of 1813, I left my house at Henderson, on the banks of the Ohio, on my way to Louisville. In passing over the Barrens, a few miles beyond Hardenbsurgh, I observed the pigeons flying from northeast to southwest, in greater numbers than I thought I had ever seen them before; and feeling an inclination to count the flocks that might pass within the reach of my eye in one hour, I dismounted, seated myself on an eminence, and began to mark with my pencil, making a dot for

every flock that passed. In a short time, finding the task which I had undertaken impracticable, as the birds poured on in countless multitudes, I rose, and counting the dots then put down, found that one hundred and sixty-three had been made in twenty-one minutes. I travelled on, and still met more the farther I proceeded. The air was literally filled with pigeons; the light of noonday was obscured as by an eclipse; the dung fell in spots, not unlike melting flakes of snow; and the continued buzz of wings had a tendency to lull my senses to repose.

"While waiting for dinner at Young's inn, at the confluence of the Salt River with the Ohio, I saw, at my leisure, immense legions still going by, with a front reaching far beyond the Ohio on the west and the beechwood forests directly on the east of me. Not a single bird alighted; for not a nut or acorn was that year to be seen in the neighbourhood. They consequently flew so high, that different trials to reach them with a capital rifle proved ineffectual; nor did the reports disturb them in the least. I cannot describe to you the extreme beauty of their aerial evolutions, when a hawk chanced to press upon the rear of a flock. At once, like a torrent, and with a noise like thunder, they rushed into a compact mass, pressing upon each other towards the centre. In these almost solid masses, they darted forward in undulating and angular lines, descended and swept close over the earth with inconceivable velocity, mounted penpendicularly so as to resemble a vast column, and when high, were seen wheeling and twisting within their continued lines, which then resembled the coils of a gigantic serpent.

"Before sunset I reached Louisville, distant from Hardensburgh fifty-five miles. The pigeons were still passing in undiminished numbers, and continued to do so for three days in succession. The

people were all in arms. The banks of the Ohio were crowded with men and boys, incessantly shooting at the pilgrims, which there flew lower as they passed the river. Multitudes were thus destroyed. For a week or more, the population fed on no other flesh than that of pigeons, and talked of nothing but pigeons. The atmosphere, during this time, was strongly impregnated with the peculiar odour which emanates from the species."

Captain Flinders relates a somewhat parallel instance: he says that while on his voyage he saw "a stream of stormy peterels, which was from fifty to eighty yards deep and three hundred yards or more broad. The birds were not scattered, but flying as compactly as the full movement of their wings seemed to allow; and this stream of peterels for a full hour and a half continued to pass without intermission, at a rate little inferior to the swiftness of a pigeon. Now taking the stratum of fifty yards deep by three hundred in breadth, and that it moved at thirty miles an hour, and allowing nine cubic inches of space to each bird, the number would amount to one hundred and fifty-one millions and a half."

The bluebird of America seems to have a power of continuous flight almost equal to that of the swallow, and among the most interesting of *established* facts on the subject of migration is that which makes it necessary that this small bird should pass at least six hundred miles over the sea. Wilson says, "Nothing is more common in Pennsylvania than to see large flocks of these birds, in spring and fall, passing at considerable heights in the air, from the south in the former, and from the north in the latter season. The Bermudas are said to lie six hundred miles from the nearest part of the continent. This seems an extraordinary flight for so small a bird; but it is a fact that it is performed. If we suppose the bluebird to fly only at the rate of

a mile a minute, which is less than I have actually ascertained them to do over land, ten or twelve hours would be sufficient to accomplish the journey."

The periodical migration of the gannet affords an instance of a mixed nature. That bird arrives early in spring, and is located in four or five spots along the British coasts, of which may be mentioned the Bass Rock, Ailsa Craig, and St. Kilda. In autumn the gannets leave their breeding-places, and are seen along the coast of England and in the Channel. In mild winters some individuals often remain, and even the whole flock has been known to winter in their summer residence. Even when they all leave the breeding-places, many individuals do not extend their migration beyond the southern coasts of England, but where the extreme point of the range may be has not yet been ascertained.

In all these cases, the distribution of food seems to be the principal cause of the movements of the birds; but in other cases it is clear that the rigour of the winter also acts as an exciting cause; yet it is doubtful whether cold alone be sufficient to drive birds from their northern haunts. Fieldfares and redwings, no doubt, leave the northern parts of Europe at the end of autumn, because at that period the ground begins to be covered with snow, so that they are unable any longer to procure food; but they merely shift, so as to place themselves on the limits of the storm, their object being apparently more to obtain the necessary supplies than to evade the cold. In mild and open winters they remain until late in spring; whereas, after snow has continued several weeks on the ground, it is seldom that any are to be seen. As to swallows, it is evident that the same cause operates most powerfully on them, because, as we have seen, they are capable of bearing as much cold as other small birds.

How far the migrations of birds may extend, has

not, we believe, been yet settled in any one instance, with a satisfactory degree of precision. In the beginning of April the stork arrives in small flocks in Holland, where it is sure to meet with a hospitable reception, and where it returns year after year to the same chimney-top. In the beginning of August, when the young are fully fledged, it prepares for its departure, multitudes assembling from the surrounding districts, and chattering with their bills, as if in mutual congratulation. At length, on the appointed night, the whole band mount into the higher regions of the air, and pursue their southward course, until they alight among the marshes of northern Africa, and especially Egypt, where they have been seen in the winter.

On the subject of the migration of storks we may quote the following anecdote, which appeared lately in several public journals:

"Last year (1833) a Polish gentleman having caught a stork upon his estate near Lemburg, put round its neck an iron collar with this inscription, 'Hæc ciconia ex Polonia' (this stork comes from Poland), and set it at liberty. This year the bird returned to the same spot, and was again caught by the same person. It had acquired a new collar of gold, with the inscription, 'India cum donis remittit ciconiam Polonis' (India sends back the stork to the Poles with gifts). The gentleman, after having shown the inscription to his neighbours, again set the bird at liberty."* It is worthy of remark, that the stork emigrates on the approach of winter, even when circumstances of food or climate cannot operate, or can operate but faintly in inducing it to do so. Thus, at Bagdad, which enjoys an extremely mild winter, and where even a slight degree of frost is not usual, the stork regularly leaves the place against the approach of that season.

* "Atlas," December 21, 1834.

In like manner the quail, which in spring is diffused over all the temperate regions of Europe, is known to betake itself, in autumn, to the coasts of Africa, and to penetrate into Arabia and Persia. Notwithstanding the smallness of their wings, they cross the Mediterranean: they wait whole weeks for a favourable wind, reposing on every small isle: hence they are taken by thousands on the Ionian isles and the coast of Asia. Should the wind change rapidly, great numbers of them perish in the sea. Swallows have been seen crossing the Mediterranean in autumn towards the African shores, but where their voyage terminates is yet unknown.

It is remarkable that all migratory birds, when detained in captivity, manifest great agitation when the period of their migration arrives, insomuch that some of them, the quail in particular, occasionally kill themselves through their efforts to escape. This agitation is always greatest at night, proving, together with observation, that birds generally commence their flight at that time. The cause of this pervading inquietude cannot be attributed either to the want of food or the increase of cold, it being experienced by individuals removed from the influence of either, and therefore must reside in some as yet mysterious warning, no doubt produced by natural causes, which the Creator and Preserver of the universe has found necessary to the safety of his creatures.

It may seem strange that birds, such as the quail and landrail, remarkable for their limited powers of flight, should be able to perform so extensive a journey as that from England to Egypt; but doubtless these, and many species of small birds, instead of flying continuously, proceed at intervals only, journeying by night and resting by day. The celerity with which swallows fly renders any exploit by them on the wing credible enough; and the steady flight of gannets, geese, and ducks, is obviously ca-

pable of carrying them over a very large space in a short time. The flight of birds generally may be estimated at from fifty to one hundred and twenty miles an hour; and if we take the mean of this, we shall find it sufficient to enable the migratory birds to perform the most extended journeys. The wonder is not in the flight itself, but in the impulse and instinct by which it is commenced and carried on.

Pennant finds no difficulty in accounting for the motive of migrations: a defect of food at certain seasons, or the want of a secure asylum from the persecutions of man during the time of courtship, incubation, and nutrition. He considers that most of the birds which leave England in spring, to spend the summer elsewhere, have been traced to Lapland, a country of lakes, rivers, swamps, and alps, covered with thick and gloomy forests, that afford shelter during summer to these fowls, which in winter disperse over the greater part of Europe. In these arctic regions, in consequence of the thickness of the woods, the ground remains soft and penetrable to the woodcocks and other slender-billed fowls; and for the web-footed birds the water affords innumerable larvæ of the gnat. The days are there long, and the beautiful meteorous nights indulge them with every opportunity of collecting so minute a food, while mankind is very sparingly scattered over those vast northern wastes.

The migration of winter birds of passage doubtless proceeds on the same general law as that which regulates the movements of those birds which spend the summer in England and leave it in winter. Birds which find the temperature and circumstances of summer in that country most congenial to their wants and habits, retire on the approach of severe weather to find something similar in the south; while others, which remain there in winter to avoid the extreme rigour of that season in the most

northerly regions, return to their own country when that rigour has abated.

M. Brehm, who has given much attention to the subject of the migration of birds, considers the following facts as established. Every bird has its native country, where it freely reproduces, and remains part of the year, travelling in the remainder. Most birds spend half the year at their home, and pass the other half in travelling. Some, particularly birds of prey, travel by day, but by far the greater part travel by night; and some perform their migrations indifferently either by day or night, They seem to pass the whole of their migration without sleep, for they employ the day in seeking their food, stopping in the places where they are most likely to find it. They commonly keep very high in the air, and always at nearly the same distance from the earth, so that they rise very high over mountains, and fly lower along valleys. They require a wind that blows *against* them, as a contrary wind assists and raises them. This last statement must, however, we imagine, be subject to some very large exceptions.

The same writer thus answers the rather difficult question, "What decides birds to emigrate?" It is not want of nourishment, for most of them commence their migration while there is still abundance in the country they are leaving. Atmospherical currents are not the cause, nor do the changes of season explain it, as the greatest number set off while the weather is yet fine; and others, as the larks and starlings, arrive while the season is bad. Atmospherical influences can only hasten the migration in autumn, but must rather retard or derange it in spring. It is the *presentiment* of what is to happen which determines birds to begin their journey. It is an instinct which urges them, and which initiates them into the meteoric alterations that are preparing. They have a particular faculty

of foreseeing the rigours of the coming season; an exquisite sensibility for the perception of atmospherical changes that are not yet arrived, but are approaching.

In conclusion, the migration of birds is a subject on which comparatively few observations have yet been made. Even the precise periods of their appearance and disappearance in different parts of Europe have not been noted with the necessary degree of attention; and until persons properly qualified shall undertake the task, we must remain contented with vague notices and unfounded conjectures. The migration of fishes, which is an equally wonderful, if not equally interesting phenomenon, is, in a great measure, placed beyond our investigation; but that of birds, being observable by any individual residing in the country, or making daily excursions to it, and sufficiently acquainted with the species, might be illustrated by simultaneous exertions made at different stations along the coasts and in the interior.

CHAPTER XXIII.

CONCLUSION.

"ILLUSTRATIONS of the power, wisdom, and goodness of the Creator," says a late author, "might be produced from the works of nature without end; they meet us at every turn; and to whatever department our inquiries are directed, they flow in upon us in overwhelming abundance. It is well worthy of remark, indeed, as showing the depth and solidity of the foundation on which rests the existence of a supreme, intelligent, and beneficent

First Cause, that the farther we push our discoveries, the more clearly are the divine perfections exhibited. It is not merely true, that on a superficial view we perceive the necessity of believing that a limited and changing world, such as that in which we dwell, could neither exist without being produced, nor be the author of its own existence; and that there must therefore be, beyond the range of our senses, an independent and uncreated Essence, without beginning, without bounds, incapable of change, intelligent, ever active, all pervading; but it it is also certain that these *primâ facie* views, as they may be called, are not only uncontradicted, but fully established by the most minute survey of the objects within the sphere of our vision; so that he who penetrates the deepest into the secrets of nature, only multiplies proofs of that most sublime and most animating truth, that 'Verily there is a God, who made and rules the universe.'"*

The study of ornithology, in all its aspects, affords numerous illustrations of the truth of these observations. Whether we consider the external form and anatomical structure of birds, or examine their faculties and habits, or compare them among themselves or with each other, or turn our attention to the admirable adaptation of their whole frame and constitution to the circumstances of external nature in the particular locality which they are destined to inhabit, or regard them with reference to other animals, either in their bodily powers or their instinctive impulses, or their mental qualities; in every light in which it is possible to view the subject, the conclusion which irresistibly forces itself on the mind is always the same. Contrivance inexhaustible, intelligence vast and comprehensive, still infinitely beyond the grasp of the human intellect, combined with a power which never fails to

* Bushman's Introduction to the Study of Nature, London, 1834.

effect its object, and a goodness which makes life in all its forms a blessing, are the characters which in this, as well as in every other department of nature, are conspicuous and undeniable. It is not absolute perfection indeed which in this search we discover. We are ourselves imperfect, and the world around us is imperfect; but it is a relative perfection which suits everything to its present condition, and which leaves nothing for a man to feel in contemplating it but a mingled sentiment of mysterious awe, profound admiration, and overflowing gratitude.

In bringing this volume to a close, let us collect the proofs which belong to this division of nature into one point of view, by a rapid glance over the road that has been travelled.

In considering the external form of a bird, the first thing that strikes the philosophical inquirer is the wisdom with which Providence has adapted it to the element in which it is destined to move. In its smooth pointed bill, and gradually enlarging head and neck, he perceives an instrument admirably calculated to penetrate the yielding air. The rounded, prowlike shape of its breast, too, is adapted with mathematical exactness to the same useful purpose; while its flexible tail is made with surprising skill to perform the part of a rudder; and its wings equally poised, and furnished with quills and feathers modelled by numerous wonderful contrivances, at once for lightness, for strength, and for tenacity, and altogether exhibiting a machine of the most perfect kind for aerial navigation. The very varieties in the nature of this machinery, adapted as they are to the faculties and instincts of each species, impress the mind with a deep sense of the minute and skilful care of a beneficent Creator, and give a peculiar interest to the investigation.

When we proceed from the external form to the consideration of the internal structure of birds, as

adapted to their peculiar function of moving through the air, we perceive a system of contrivances evidently intended to promote the same end. In the mechanical art exhibited in the formation of the bones and muscles, by which power and motion is given to the wings; in the conformation of all the bones, uniting strength with lightness; in the air so singularly distributed through the bones and in other parts of the body; in the modification of the intestines; in the whole comparative anatomy, in short, of the winged tribes, we trace, with an astonishment increasing in proportion to the diligence of the research, the same unceasing solicitude to adapt everything to their nature.

If again we compare the different species of birds among themselves, whether as to the climate they are formed to inhabit, or the localities they are destined to frequent, or the food on which they are intended to subsist, we still meet with obvious indications of wise and beneficent design. Contrast the legs and feet of the swift, which never alights on the ground, but clings to the perpendicular face of walls and rocks, with those of the heron, which wades in search of food on the margin of the marshy pool, or compare the broad-billed and web-footed duck, whose proper element is the water, with the sharp talons and strong hooked beak of the eagle and other birds of prey; and with certainty we must infer the wide difference of their habits and instincts, from the simple inspection of the instruments with which their Creator has furnished them.

In the mutual adaptations, indeed, of the structure of the various races of birds to their faculties and propensities, we perceive a world of wonders, calculated to make a lively impression on a reflecting mind, and to fill it with the most interesting views of the great Author of Nature. In examining the vast variety of these faculties and propensities, we have uniformly found that a corresponding va-

riety exists in the conformation of the species, which irresistibly confirms what every department of nature unites in proclaiming, that nothing is formed without an intelligent, consistent, and infinitely comprehensive plan. We do not know if there be any other class of animals, from the microscopic insect whose world is a blade of grass, up to the quadruped that ranges the woods and the forests, which in this respect teaches lessons of more varied and edifying instruction. The earth, the air, and the waters teem with feathered inhabitants, and, in reference to all these elements, the peculiarities with which the Creator has distinguished the various tribes is amazing, whether we consider the wisdom and beneficence of the contrivances in themselves, or the consummate skill with which they are suited to the respective situation in which these tribes are intended to exist. Consider, for example, the productive powers and the corresponding instincts by which Providence has secured the preservation of the respective species. The egg is itself an admirable production; and how mysteriously is the chick developed, till it bursts its own shell at the appointed and appropriate moment, rejoicing in its new existence! The nest, too, sometimes so artificially formed by the mother-bird, and her tedious and self-denying period of incubation, as well as her maternal care of the callow brood when hatched, are instances so full of intelligence and forethought, that it seems as if the hand of the Deity himself were visibly displayed, tenderly guiding her unconscious path.

Nor is it possible to overlook the means and adaptations by which the life thus mysteriously bestowed continues to be preserved. To all the species, however diversified, food of some kind is necessary; and therefore all are furnished with organs of swallowing and digesting suited to their respective wants. But these organs would be alto-

gether useless were not two considerations superadded—an instinct to desire and select the proper food, and a locality in which that food is to be obtained. It is curious and edifying to observe with what discrimination the young of these animals, without experience and without instruction, instinctively seize on the particular kind of food adapted to their digestive organs, rejecting all other kinds, however palatable and nutritive to creatures of a different species. Nor is it less worthy of remark, that there is scarcely a vegetable or animal production which some species of bird does not seem created to feed upon; and that, speaking generally, wherever that peculiar production is to be found, there is also to be found the particular kind of bird to which it furnishes wholesome food. We have already remarked the astonishing celerity with which, in tropical countries, vultures and other birds of prey congregate from all quarters of the heavens around a dead carcass to devour it, indicating at once the acuteness of their sight, and the remarkable provision which has been thus made for the destruction of what might otherwise injuriously infect the atmosphere; and we may now rank this fact among those that establish, or, at least, illustrate, the wise arrangements to which we have been adverting.

We are reminded, by what has been just said, of the peculiar intensity of some of the senses in certain species of birds, which opens another view of the wise and beneficent provisions of Providence. It is by the remarkable strength of their vision that birds of prey are enabled to mark their quarry at a height where, to the human eye, they themselves are almost invisible, and from whence, with incredible velocity, they pounce on their unsuspecting victims, and it is doubtless the same extraordinary faculty which, if it does not enable, at least powerfully assists, the migratory tribes to shape their

course through the trackless atmosphere and over unbeaconed seas. When the carrier-pigeon is let loose in a strange region, he darts suddenly aloft in spiral circles, increasing the diameter at every turn, till at last, having, from his airy height, descried some known familiar spot in the remote distance, he shoots directly forward to his home like an arrow from a bow.

The hearing of birds, so necessary for escape from dangers as well as indicating the neighbourhood of their prey, is scarcely less perfect in many species than their sight; yet the external ear, which is essential for producing distinctness of sound as the organ is formed in quadrupeds and man, would obstruct their rapid progress through the air, and be inconvenient in other respects. This appendage is therefore withheld, but it is amply compensated by a peculiarity in the internal structure, a circumstance which indicates the never-failing resources of the Creator. This may be considered as a slight and, perhaps, a trifling change; but it acquires importance as being one of an infinite variety of beneficent contrivances for the comfort and happiness of the different tribes of animals, wisely adapted to the peculiarities of their condition.

We do not know, indeed, that there is anything among the wonders of creation, which strikes the inquiring mind more forcibly than instances of departure from an ordinary rule for the obvious purpose of accommodation to circumstances. In comparative anatomy such accommodations incessantly occur, and it is this which gives so peculiar a charm to that interesting department of science. Were all animals to be formed precisely on the same external model, or were deviations from a common form to bear no distinct reference to their localities and instincts, it would be less easy to refute the comfortless theory of the infidel, who refers all the operations of nature to material causes, and ex-

cludes from the universe the designing hand of an intelligent Creator. There might then be less absurdity in the monstrous hypothesis which teaches that all things have been the result of a mere brute mechanism, and that the same active, but blind and insensible, powers which produce a crystal have, under happier combinations, called into existence more perfect organizations, and resulted in the formation of living beings. Such an argument would still, indeed, have been quite untenable, but the demonstration by which it is disproved would have been less perfect and satisfactory, had we been unable to show with what extreme and anxious solicitude the most minute particulars, in the organic structure of each species of animal, are made to harmonize with each other, and with what surpassing skill they are suited to their individual nature and offices.

Such a mode of reasoning presents itself to the mind with peculiar force when any one organ is selected, and its peculiarities are distinctly traced in different races of living creatures. A recent author has employed an argument of this kind with much facility in reference to the human hand.* He has traced the rudiments and framework of this most perfect mechanical contrivance through all the various species of mammalia, beginning at the monkey and ending with the whale, and his demonstrations show that the very same instrument is employed in them all, but that it is, with the most astonishing wisdom, adapted to the peculiar faculties and functions of each distinct tribe, being moulded in one class into a paw, in another into a solid hoof, in a third into a tool for digging, in a fourth into a fin for dividing the water. The examination of this one contrivance in such various forms—not to mention the innumerable others

* Sir Charles Bell's Bridgewater Treatise.

which, were we so inclined, we might adduce—all of them curiously adapted by some slight variation to the special use of the animal in whose possession it is found, affords a proof of design too palpable and striking to be resisted. It is as if one were to go into the premises of a millwright, and observe the various mechanics engaged each in his respective department with saws of different kinds and dimensions, from that coarse and strong instrument which divides the forest-tree into planks to the tiny tool employed in the more delicate labours of the workshop. He would say with unhesitating certainty, here is a most useful invention, beautifully adapted to the various purposes of the artificer. The existence of one saw would be a proof of contrivance, but that proof is multiplied a hundred fold by the skill with which the contrivance is modified to suit it for such numerous and nice operations.

An evidence of a similar kind, but on a far more extensive scale, is derivable from the innumerable adaptations which exist between the bodily development of the various tribes of animals and their instincts and mental capacities. In our chapter on reason and instinct, we have entered very fully into this most interesting subject; and the preceding history of the faculties of the feathered race will afford abundant illustrations of the truths there contained, and we scarcely know what stronger proof could be required of a supreme creative Intelligence.

In conclusion, we would observe, that there is something exceedingly delightful in the view which nature exhibits of the multiplicity and diversity of animated beings, each adapted to its own peculiar sphere, and all, at the same time, so abundant as to leave no large portion of the terraqueous globe without inhabitants. If there are differences in climates, there are also differences of constitutions

and instincts, suiting living creatures to exist and to enjoy existence in them all. From the glowing equator to the vicinity of the frozen poles, all nature is instinct with life and buoyant with happiness. On the dry land, the fields and the deserts, the woods and the forests, the valleys and the mountains, all teem with animation and are vocal with joy. The waters, the lakes, the rivers, and the mighty ocean from shore to shore, bring forth and nourish their myriads of living creatures, different in kind, but united by a wonderful analogy into one grand and mighty chain of existence, all fitted with superlative wisdom to their respective habitations. Even the viewless air is not void of life and indications of enjoyment; the feathered tribes there soar with the wings which all-bountiful nature has provided, traversing fearlessly the blue expanse, and singing as they mount towards the clouds.

Nor is it to be forgotten, that of all sublunary creatures, man alone is endowed with faculties capable of discerning the Creator's hand in his works. Had not the human race been called into existence, all these magnificent provisions would have been unappreciated and unknown. The glories of the Divine perfections would still, indeed, have been inscribed on nature, but among earthly existences there would have been no eye to read and no heart to feel them. Man has justly been called the priest of nature, and while from the seen he rises to the unseen, from the temporal to the eternal, he ought never to forget that the high rank which has been assigned him implies a high responsibility; and that, in proportion as his vision is enlarged and his faculties are exalted, his duties and obligations are, to an equal extent, increased.

THE END.

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